ICES WGEAWESS REPORT 2016

ICES STEERING GROUP ON INTEGRATED ECOSYSTEM ASSESSMENTS COMMITTEE

ICES CM 2016/SSGIEA:02

REF. ACOM AND SCICOM

Final Report of the Working Group on Ecosystem Assessment of Western European shelf Seas (WGEAWESS)

14-18 March 2016

Belfast, Northern Ireland

ICES CIEM

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2016. Final Report of the Working Group on Ecosystem Assessment of Western European shelf Seas (WGEAWESS), 14-18 March 2016, Belfast, Northern Ireland. ICES CM 2016/SSGIEA:02. 57pp.

Contents

Executive summary

The WGEAWESS meeting was held in Belfast, Northern Ireland (UK), on 14–18 March 2016, with nine participants from five countries. The meeting was chaired by Steven Beggs (UK (NI)) and Eider Andonegi (Spain (Basque Country)). This was the final year of the ongoing three-year terms of reference during which the group have had three meetings and one by correspondence in 2014. During the three-year period, the group has made good progress in all ToRs. The initial activity of the group has included the cataloguing and identification of datasets that would be potentially valuable in an IEA. As well as environmental data the identification of the main sector/human activity linkages to pressures imposed on the region have been identified through the ODEMM[1] linkage framework. This has been developed for a number of regions and subregions. Using datasets identified by the group integrated trend Analysis (ITA) has been developed for a number of subregions. This approach depends on suitable time-series has been useful in identifying and exploring ecosystem states and trends, while revealing biotic and abiotic drivers, such as fishing and climate.

During the current three-year term, the group has been active in both collaborating with related ecosystem groups and providing advice to other activity in ICES. The work of the group has contributed significantly to the development of the ICES Celtic Seas and Bay of Biscay and Iberian Seas ecosystem overviews, published in 2016. The group have also contributed to the efforts of the Benchmark Workshop on the impact of ecosystem and environmental drivers on Irish Sea fisheries management (WKIRISH) initiative. In 2013, the group met back-to-back with the Working Group on Integrated Assessments of the North Sea (WGINOSE) in Lisbon, Portugal, while in 2015, the group met back-to-back with the ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB) in Cádiz, Spain. The work of the group was also presented at the ICES ASC in A Coruña, Spain, 2014. This is the last of our first three-year Terms of Reference period, and the meeting was hosted by AFBI in Belfast, making good progress for each of the ToRs defined.

For the final meeting a review of the ToRs was made. An implementation of the Options for Delivering Ecosystem-Based Marine Management (ODEMM) framework was presented for the Irish Sea as a nested example of the previously developed Celtic Seas Ecoregion (ToR a). The process highlighted the impact of scale on the emerging key components and pressures identified by the ODEMM approach, while also demonstrating the flexibility as a tool for identify linkages and pressures in other ecosystem regions. As with the regional level Celtic Sea analysis, the Irish Sea specific ODEMM analysis identified species extraction and bycatch as the main pressures across all ecosystem components. The human activity most associated with these pressures was fishing and in particular bottom fishing. This preliminary analysis is particularly relevant to the WKIrish group, and may be applied in similar regional and case study format to other areas of the Western Shelf Seas area. Recent developments from the ODEMM project were presented, such as linking the risk assessment to potential management options, ecosystem services and valuation of those services, and discussion ensued as to their relevance and potential use and application in future WGEAWESS IEAs. For further development of the ODEMM framework, a clear interaction need has been identified with economist, social scientist, and stakehold-

[1] Options for Delivering Ecosystem-Based Marine Management

ers, and with researchers dealing with ecosystem services, such as the members of the ICES Working Group on Resilience and Marine Ecosystem Services (WGRMES).

Integrated Trend Analyses were further developed and presented during the 2016 meeting and results from these are reported in ToR b. The ITA work presented for the Irish Sea is in also related to the activity carried out for WKIrish.

The group completed a review of the Ecosystem Overviews (EOs) recently published by ICES for Celtic Sea Ecoregion and the Bay of Biscay and the Iberian coast Ecoregion. The past work of the WGEAWESS group has contributed extensively to these overviews, which are considered living documents. Recommendations for adjustments to the present content were made.

Additionally two developing IEAs were presented: one in the Gulf of Cadiz and the other one in the Bay of Biscay, both aiming at progressing towards the implementation of the Ecosystem-based Fisheries Management in these subregions. The project of the Gulf of Cadiz is focused on the Guadalquivir estuary, an important nursery area for many species including anchovy. The estuary is subject to human pressures including intensive agriculture and aquaculture. The analysis is exploring how these pressures affect the local anchovy nursery area that is located in the river mouth. Knowledge and support from marine, social scientists, and stakeholders is paramount to the successful delivery of the project. Finally, during the meeting the group discussed the new ToRs for the next 3-year-period. The group will continue working with the following groups and will also establish relationships with the stock assessment groups in the area.

- Workshop on the impact of ecosystem and environmental drivers on Irish Sea fisheries management (WKIrish);
- Working Group on Resilience and Marine Ecosystem Services (WGRMES);
- Working Group on Multispecies Assessment Methods (WGSAM);
- Working Group on the Ecosystem Effects of Fishing Activities (WGECO);
- Other IEA ICES groups like the ACOM/SCICOM Workshop on Integrated Ecosystem Assessment Methods (WKIDEA).

1 Administrative details

Working Group name

WGEAWESS

Year of Appointment within the current three-year cycle

2013

Reporting year concluding the current three-year cycle

2016

Chair(s)

Eider Andonegi, Spain (Basque Country, Spain)

Steven Beggs, UK (Northern Ireland)

Meeting venue(s) and dates

22–25 April 2014, Gijón, Spain, via Webex and correspondence, (7 participants)

9–13 March 2015, Cádiz, Spain, (13 participants)

14–18 March 2016, Belfast, UK (NI), (9 participants)

2 Terms of Reference a) – z)

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
a	Carry out metadata compilation for all eco-system components available according to ODEMM framework. Preparatory to carrying out IEA.	This is linked to the recommendation from database.	4.3	2 years	Database linked to ICES for Regional Sea Programmes
b	Carry out preliminary evaluation of data and trends for a regional Integrated Ecosystem Assessment.	Linked to Benchmark SSGRSP guidance for methods.	4.2	3 years	Report and articles on GES status of Regional Sea
c	Summarize and update the regional Ecosystem overviews.	Linked to WKECOVER and ACOM/SCICOM advice.	4.2	3 years	Articles, atlas.
d	Identify ecosystem trends relevant to stock assessment and management and report these accordingly.	This would be linked to the commitment to provide advice in the context of EBAFM.	4.1	Ongoing	

3 Summary of Work plan

Year 1

The main task will be to catalogue the datasets available that would be potentially valuable in an IEA (provisionally ODEMM approach. Metadata and description will be compiled into a database. This will particularly focus on identifying pressure state relationships that are appropriate to Ecosystem Based Fisheries Management (EBAFM). Ongoing identification of important trends in ecosystem indicators.

Year 2

Carry out provisional ODEMM (or other IEA) analysis, using Working Group (WG) membership, and reporting on results, gaps, and weaknesses, and way forward. Ongoing identification of important trends in ecosystem indicators.

Year 3

Follow up on previous year IEA, refine including any new data acquired on the basis of the gaps analysis in the previous year. If appropriate, hold a workshop with a wider participation. Ongoing identification of important trends in ecosystem indicators.

4 Summary of Achievements of the WG during 3-year term

- Celtic Seas and Bay of Biscay and Iberian waters Ecosystem overviews for ICES advice;
- Cataloguing and identification of datasets that would be potentially valuable in an IEA in Western Waters;
- Implementation of the ODEMM framework for Celtic Seas and Bay of Biscay Ecoregions as well as development of nested Irish Sea subregion;
- Ecosystem models have been used in the Bay of Biscay and the Gulf of Cadiz: Ecopath and Ecosim (EwE) tool has been selected for that in both cases;
- "The Integrated Assessment as the main goal for achieving an Ecosystem Approach to Management in the Western European Shelf Seas". Oral presentation by E. Andonegi at the ICES Annual Science Conference, 15–19 September 2014, A Coruña, Spain;
- "Preliminary IEA for Irish Sea" Oral presentation by S. Beggs to ICES Benchmark Workshop on the impact of ecosystem and environmental drivers on Irish Sea fisheries management (WKIrish1), 14–15 September 2015, Dublin, Ireland.

5 Final report on ToRs, workplan and Science Implementation Plan

5.1 ToR a) Carryout metadata compilation for all ecosystem components available according to ODEMM framework. Preparatory to carrying out IEA.

Big efforts have been made during this period aiming at compiling the metadata available for all ecosystem components in the region, as a continuation of the work done in the first year of this WG (ICES, 2011). This information is listed in in Annex 4.

To deliver holistic ecosystems-based marine management, managers must know the factors affecting the ecosystem if they are to manage/mitigate for them. Here, a risk assessment framework, based on the EU FP7 funded ODEMM (Options for Delivering Ecosystem-based Marine Management) approach, was presented. The framework traces the multiple sectors affecting the marine environment, the pressures they create, and the ecological characteristics affected by them. Scores are assigned by an expert panel detailing the extent, overlap, degree of impact, persistence, and resilience for each pressure pathway, based on predetermined thresholds. From this information, pressure matrices are created that can be used to calculate scores to indicate an overall impact risk score and recovery timeline estimates.

During the three-year term, the group work has mainly focused on updating and populating an ODEMM based metadata with components, MSFD descriptors, and indicators. The ODEMM framework has been described in previous reports (ICES, 2013). This has been done for Celtic Seas and the Bay of Biscay of which an overview was presented in ICES (2015). The Celtic Seas ODEMM analysis for example has data support for 1892 linkages (Figure 5.1). The process has also been initiated for the Irish Sea subregion in support of the WKIrish benchmarking process.

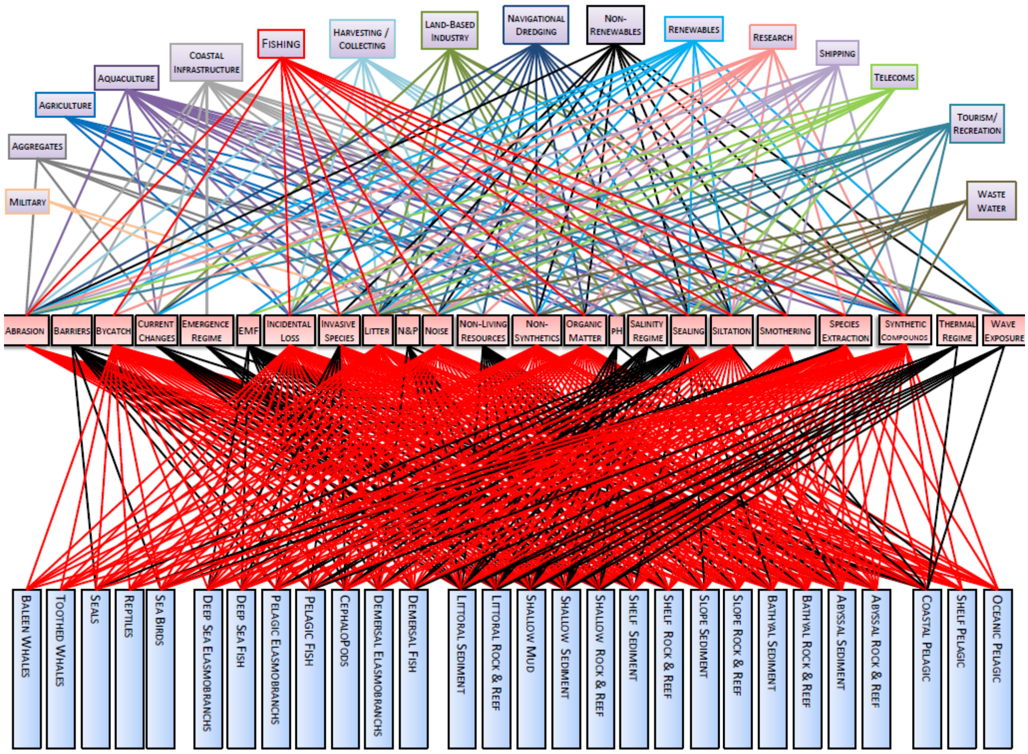

Figure 5.1. A full linkage diagram for Irish waters developed under the ODEMM framework. The top, curved line of boxes represents the sectors considered, the middle line represents the pressures imposed by those sectors, and the bottom line represents the ecosystem components evaluated. This figure is also often described as a "horrendogram" The red lines represent the linkages from the fishing sector.

The preliminary Irish Sea specific ODEMM analysis was presented in the final meeting. The analysis identified species extraction and bycatch as the main pressure across all ecosystem components (Figure 5.2). The human activity most associated with these pressures was fishing and in particular bottom fishing (Figure 5.3). Irish Sea fisheries have changed from a cod, whiting, sole, and herring-dominated fishery in the 1960s to one which is dominated by *Nephrops* and other shellfish stocks today. These fisheries operate with bottom-trawling nets and their effort is highest on the muddy substratum associated with *Nephrops* grounds (Figure 5.4).

Recovery time calculated as a combination of the resilience and persistence scores was highest for current changes, invasive species, sealing, and non-synthetic and synthetic compounds.

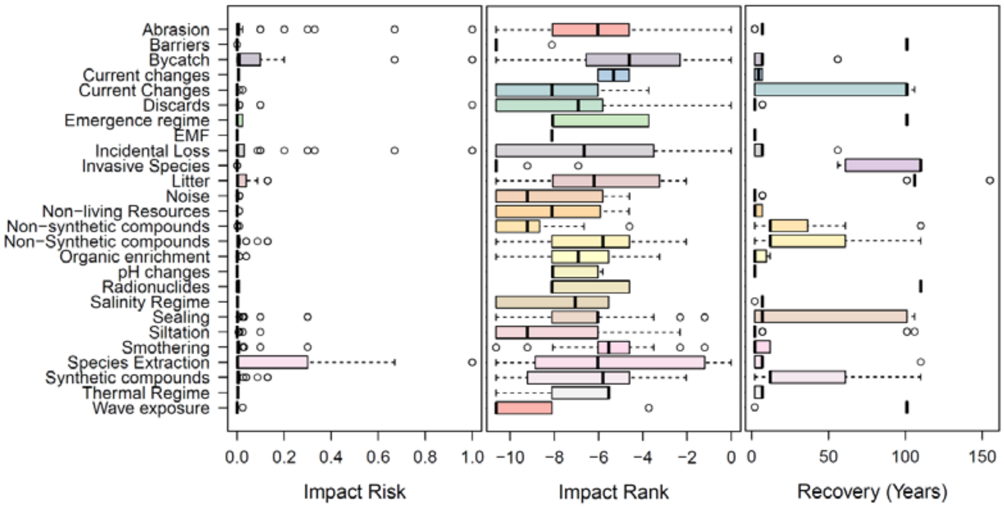

Figure 5.2. Provisional impact risk and recovery boxplots for pressures in the Irish Sea. Middle lines of boxplots represent median values, the boxes represent 25% quartiles from the median, with outliers shown as black dots. The first panel illustrates their actual calculated score, whereas the second panel allows identification of the ranking of the pressures. The final panel illustrates the expected recovery time in years for each of the identified pressures.

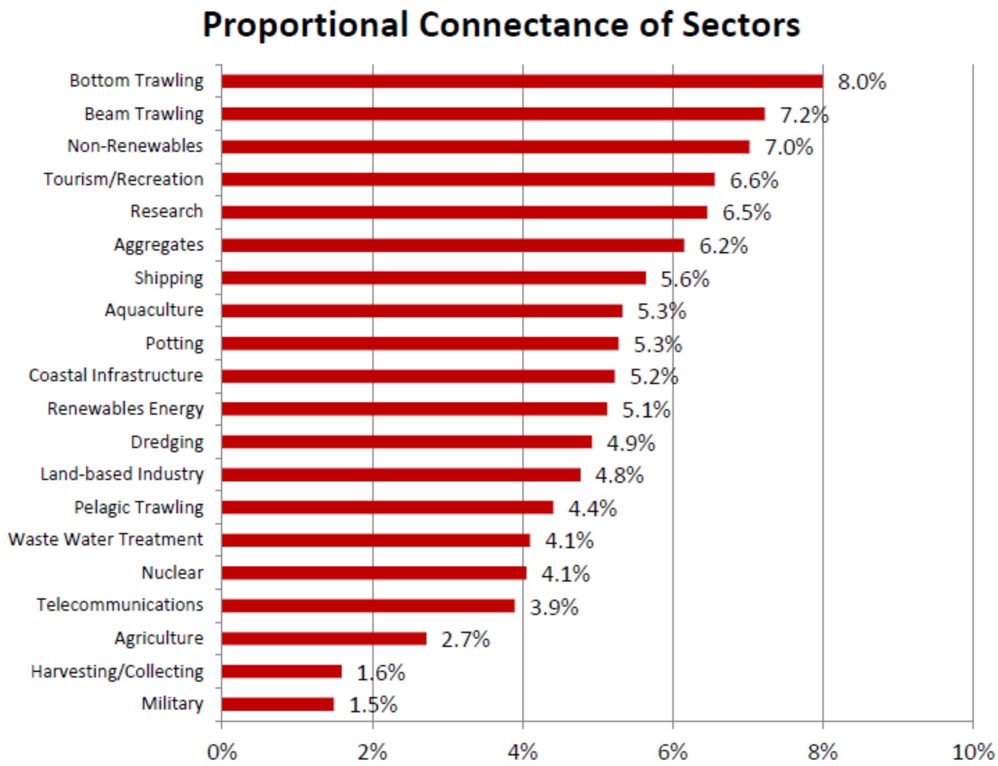

Figure 5.3. Provisional proportional connectance graph of sectors in the Irish Sea, illustrating the ranking of sectors according to the number (not severity) of pressures and ecological characteristics they affect.

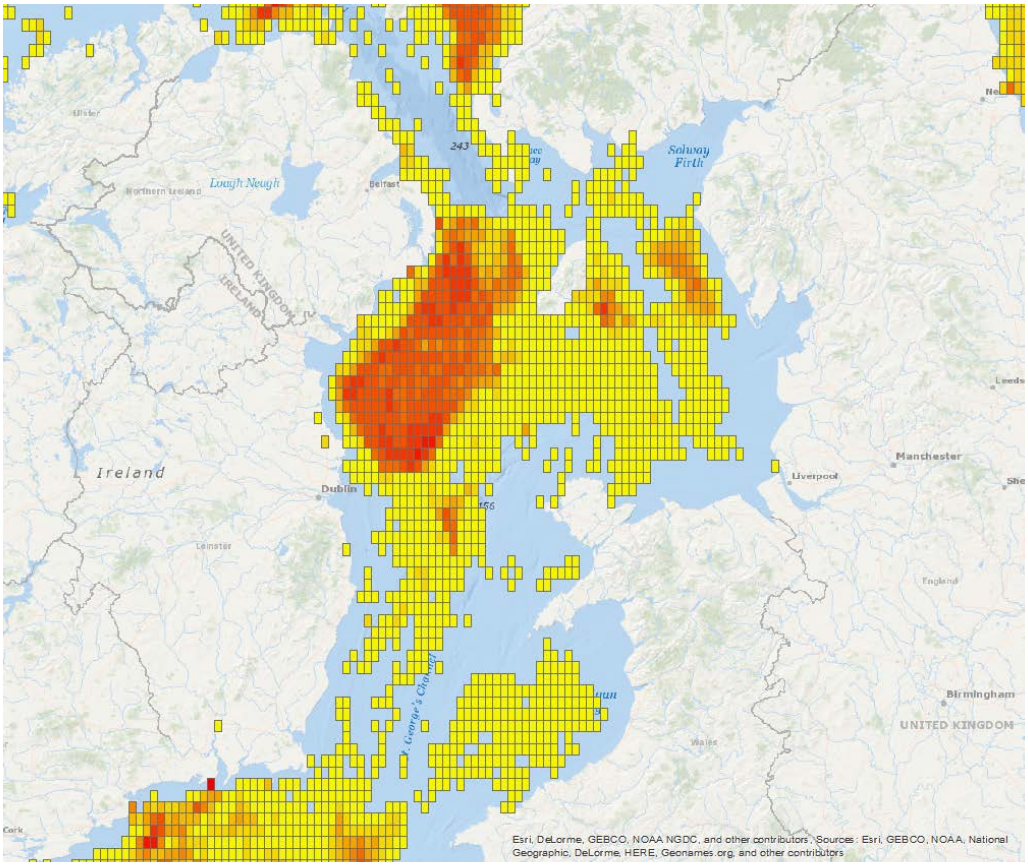

Figure 5.4. Surface abrasion pressure expressed as the swept-area ratio from VMS data from 2013 in the ICES Irish Sea ecoregion (ICES, 2015b).

5.2 ToR b) Carryout preliminary evaluation of data and trends for a regional Integrated Ecosystem Assessment.

As well as reporting on specific trends in abiotic and biotic time-series from the region, the group has also undertaken Integrated Trend Analysis for a number of subregions. The preliminary results of ITAs for the Irish Sea and Gulf of Cadiz were presented in the previous report (ICES, 2015).

Integrated Ecosystem Assessment of the Irish Sea

The results of a preliminary Integrated Ecosystem Assessment (IEA) of the Irish Sea, initially undertaken as part of the workshop on the impact of ecosystem and environmental drivers on Irish Sea fisheries management (WKIrish) process, were presented to the group. IEAs consider the physical, chemical, and biological environment – including all trophic levels and biological diversity – and treat fish and fisheries as an integral part of the ecosystem (Diekmann and Möllmann, 2010). The approach has been shown to be useful in defining ecosystem state and in understanding function and drivers in a holistic manner. IEAs take into consideration a suite of indictors representing the biotic components and abiotic drivers of the ecosystem. For the Irish Sea, time-series (1971–2013) of abiotic and biotic indicators describing the climate, hydrography, nutrients, phytoplankton, zooplankton, fish, and fisheries were assembled from various sources and analysed according to Diekmann *et al.* (2012).

The analysis highlighted considerable changes in the Irish Sea ecosystem since the 1960s. Hydrographic conditions in the Irish Sea are associated with large-scale ocean atmospheric oscillations as represented by the Atlantic Multidecadal Oscillation (AMO) and the winter North Atlantic Oscillation (NAOw) (Figure 5.5). Interannual variability of Irish SST records is dominated by the AMO (currently is in its warm phase), explains approximately half of the current warm anomaly in the record (Cannaby and Hüsrevoğlu, 2009). The recent intense warming of SSTs in Irish waters since the late 1990s can be attributed in approximately equal measure to the combined effects of the global warming trend and these large-scale ocean atmospheric oscillations. The NAO is more variable with positive phases associated with stronger westerly winds and increased precipitation.

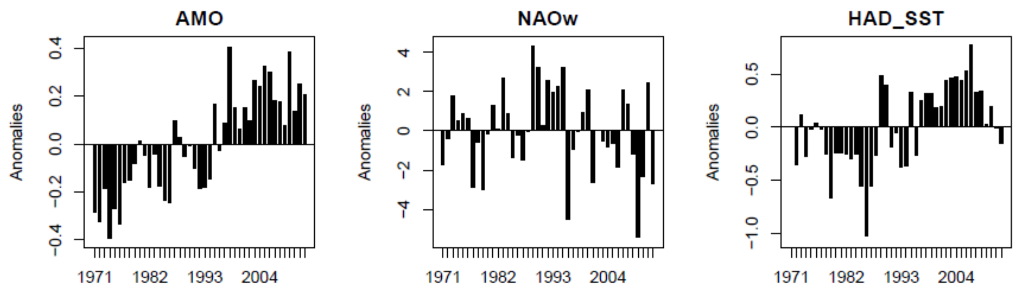

Figure 5.5. Ocean atmospheric systems and temperature 1971–2003. Anomaly plots showing the positive phase in AMO and the associated high SST values in the Irish Sea. Winter North Atlantic Oscillation is more variable with the most recent values predominantly negative.

Nutrient data from the long-term Cypris station (Allen *et al.*, 1998) highlight changes in nitrogen (N) and phosphate (P) levels, reflecting riverine inputs via anthropogenic sources (Gowen *et al.*, 2002). Winter (January and February) concentrations of P have declined since the late 1980s thought to be in part due to the reduction in P usage in detergents (Gowen *et al.*, 2002) (Figure 5.6). The greenness of the CPR silk (the Phytoplankton Colour Index (PCI)) reflects the biomass of diatoms and dinoflagellates (Richardson *et al.*, 2006), which increased over the time-series.

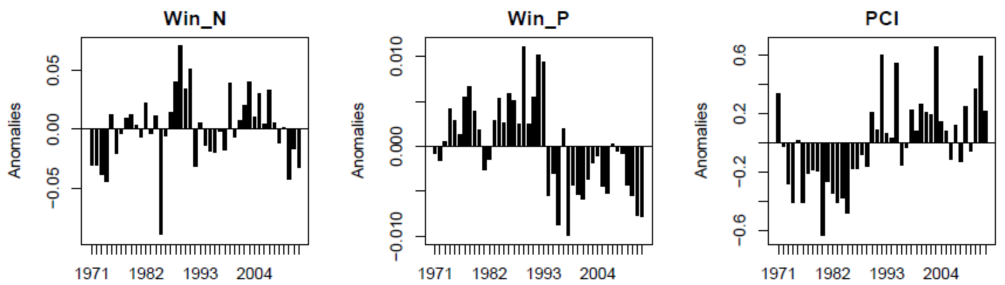

Figure 5.6. Nutrients and phytoplankton colour index (PCI). Anomaly plots showing winter Nitrogen and winter Phosphate values from Cypris station, Irish Sea. Phytoplankton colour index from CPR.

Trends in zooplankton species and groups from CPR were analysed. Of the copepod species, most species showed higher variability and/or lower relative abundance in the latter part of the time-series. Possible exceptions were *Calanus helgolandicus* and

Centropganes typicus both copepod species associated with increased productivity in warmer waters.

These changes are a reflection of rising sea temperatures in the Northeast Atlantic. Ecosystems of the northeast North Atlantic have change toward a warmer dynamical equilibrium , attributed to an increase in the flow of the European slope current (Beaugrand *et al.*, 2002). Over the last 50 years, the abundance of *C. finmarchicus* has decreased in the Northeast Atlantic Ocean. In contrast, the warmer water copepod, *C. helgolandicus*, has become more abundant in many regions (Beaugrand, 2003) (Figure 5.7). The shift in copepod community composition has influenced the growth, recruitment, and survival of other trophic levels such as seabirds (Wanless *et al.*, 2005) and fish (Beaugrand *et al.*, 2003).

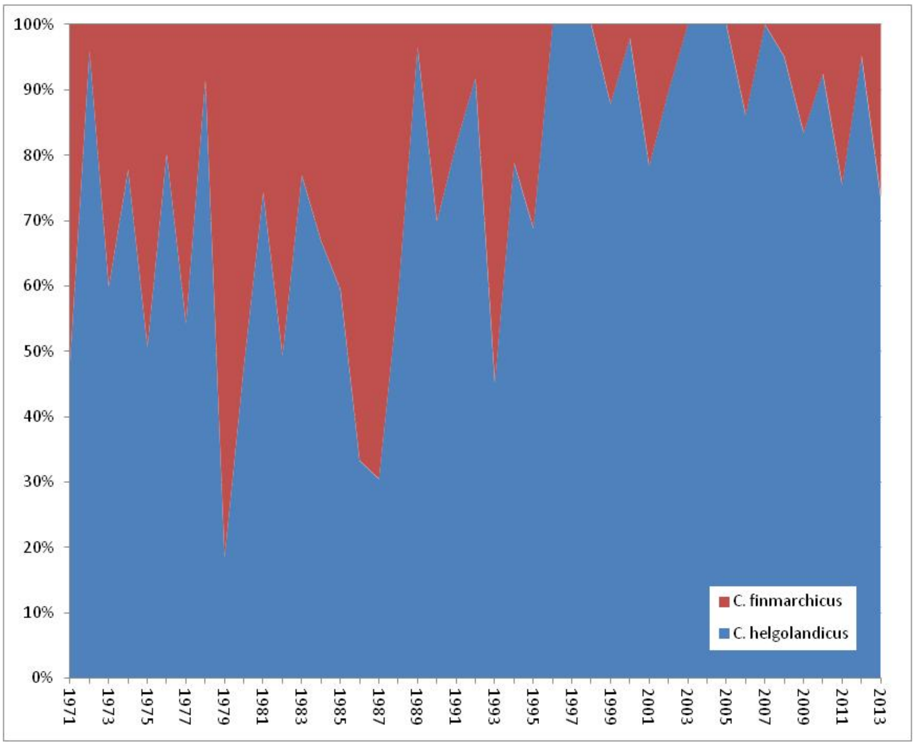

Figure 5.7. Annual ratio of *Calanus finmarchicus* to *Calanus helgolandicus* in Irish Sea between 1971 and 2013. Data from CPR survey. *Calanus finmarchicus* is a cold water affinity species and *Calanus helgolandicus* a warm-water affinity species.

Gelatinous material and decapod larvae both increased in the recent period. A general decline in cold water affinity species such as *Calanus finmarchicus* and *Para-Pseudocalanus* spp., both favoured by cod larval and juveniles, has been linked to the decline in productivity of some southern stocks (Pitois and Fox, 2006; Heath and Lough, 2007). Declines in zooplankton is important for fish recruitment and concurrent increases in phytoplankton have been linked to possible reductions in grazing pressure on phytoplankton (Lynam *et al.*, 2011).

Single-stock assessment outputs data for cod, sole, and herring and landings data for *Nephrops*, were used to represent changes in the demersal, pelagic and *Nephrops* fisheries. The trends highlighted the declines in sole and cod spawning–stock biomass (SSB) and recruitment. Further, the trends in cod mortality highlighted the sustained high mortality in this stock. This is despite the vast reduction in fishing effort on this stock.

An overview of all temporal changes in the Irish Sea time-series was represented by a traffic light plot (Figure 5.8). Variables were sorted according to their principle components (PC) PC1 loadings, generating a pattern with variables that demonstrated an increasing trend with time (red to green), to variables demonstrating a decreasing trend (green to red). Variables with more variable trends are located in the centre of the plot. The traffic light plot highlighted the decline in cod and sole SSB and many key zooplankton groups (*Calanus finmarchicus*, *Para- Pseudocalanus* spp., *Euphausiids*). Increases in SST and PCI were associated with the positive phase of the AMO, emphasizing the importance of this driver in this region. Meanwhile herring SSB has shown a more variable interannual fluctuation which it shares in common with a number of zooplankton groups and the climatic index NAO.

The PCA resulted in 29.6% and 17.2% of the explained variance on PC1 and PC2, respectively. Time trajectories of year scores of PC1 show a steady increase (negative trend), over the time-series, while PC2 was more variable, currently in a negative phase after a rapid drop (Figure 5.9).

The time trajectory plot suggests the beginning of a transition during 1988/1989 with the major transition period identified in 1995/1996. This was associated with higher cod mortality, reductions in key zooplankton species concurrent with increases in the AMO and SST. The transition period of 1995/1996 is marked by noticeable changes in the circulation of the North Atlantic and in its overlying atmosphere in the mid-1990s affected the biota of most, probably even all ecosystems of the northeastern Atlantic (for review see (Alheit *et al.*, 2014). The analysis therefore suggests that the Irish Sea ecosystem is currently in a new state driven by these complex oceanographic and atmospheric systems that have affected all levels of the ecosystem. This transition was further supported by the constrained clustering analysis, which suggests two main phases (Figure 5.10).

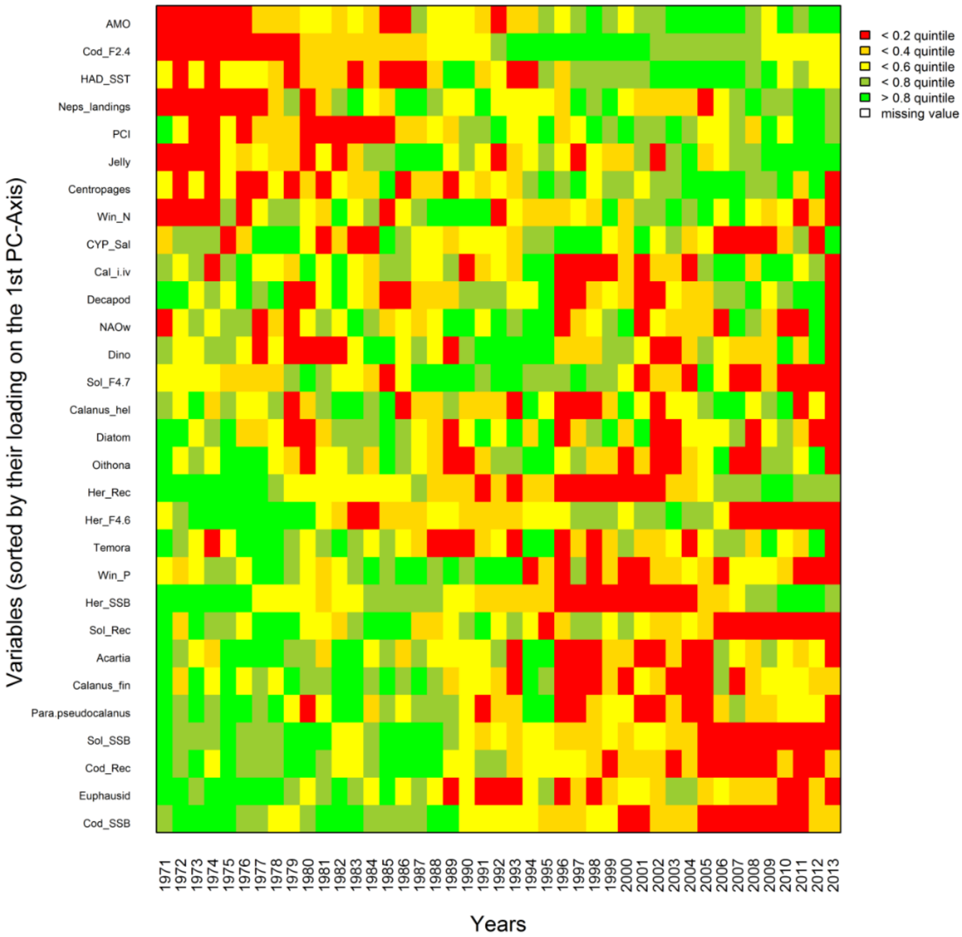

Figure 5.8. Traffic light plot of the temporal development of the Irish Sea time-series. Variables are transformed to quintiles, colour coded (red = low values, green = high values), and sorted in numerically descending order according to their loadings on the first principle component.

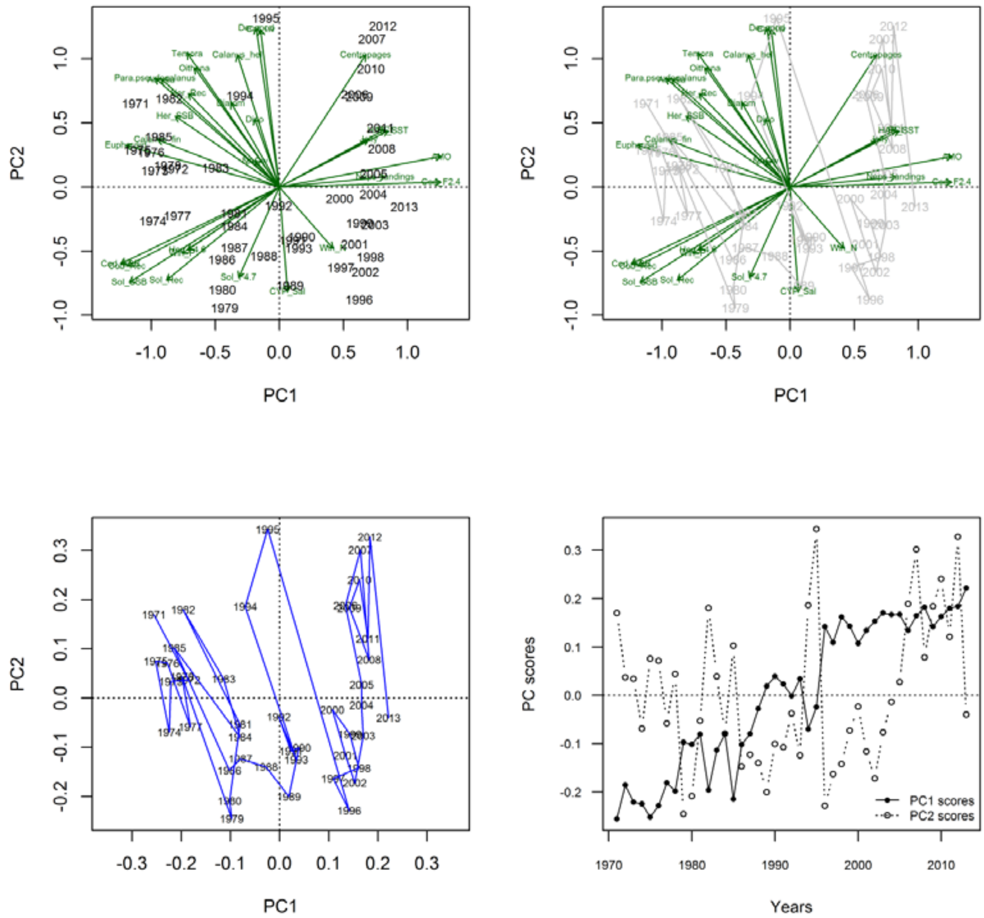

Figure 5.9. Biplots of variable loadings and time-trajectories of year scores in the PC1 and PC2 plane for the Irish Sea time-series 1971–2013 (top row). Results of the standardized principal component analysis using all 30 variables assembled for the Irish Sea showing PC1 (black circles) and PC2 scores (white circles) against time, and the time trajectory on the first factorial plane. PC1 = 29.6%, PC2 = 17.2% explained variance (bottom row, from left to right).

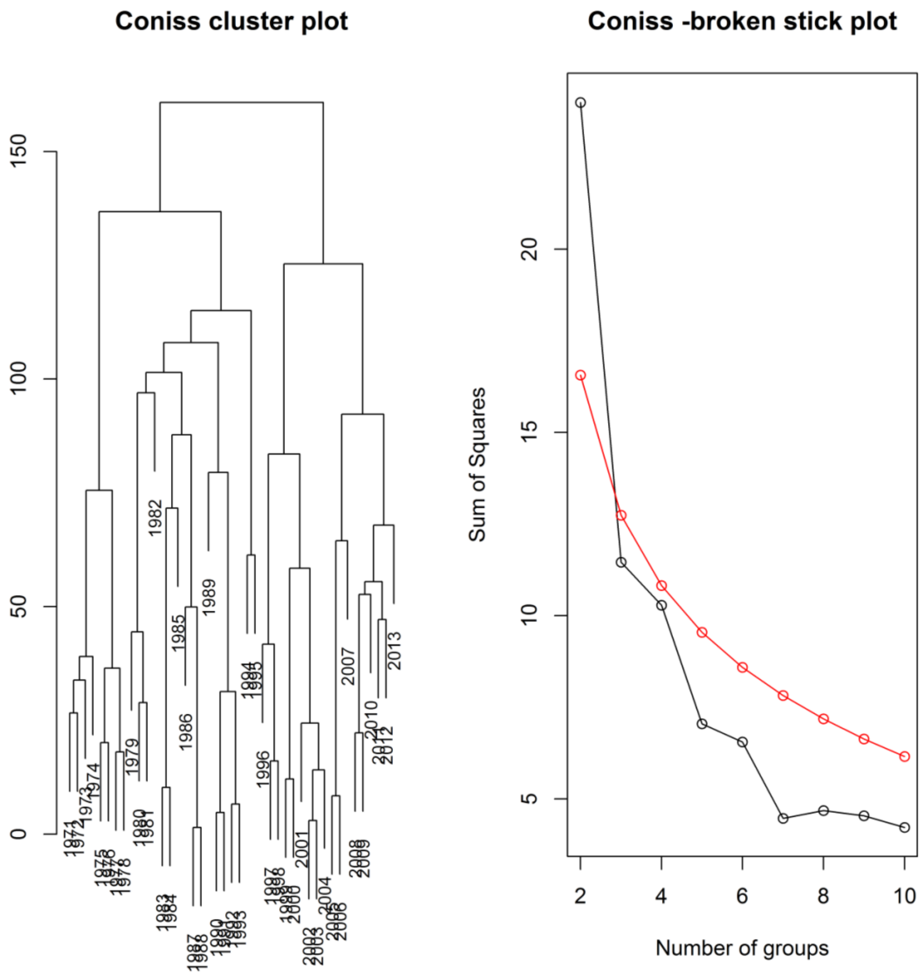

Figure 5.10. A cluster plot from the Constrained Clustering Analysis and a broken stick model to determine the number of significant groups in the cluster analysis. The red curved line indicates the critical values and suggests two significant groups.

Further exploration of the datasets available for representing missing but important components of the ecosystem is needed. In particular small pelagic clupeoid species, particularly sprat, and other historically important fish species such as whiting should be investigated. Evidence of increases in anchovies during the late 1990s and current high abundances of sprat (average > 200 000 t since 1998) suggest these species may be having a greater impact on the Irish Sea ecosystem in the recent period (Armstrong *et al.,* 1999; Petitgas *et al.,* 2012). The CPR larval dataset may be a source for longer term series on clupeid species larval abundance and recruitment or SSB index as illustrated for other species in neighbouring sea areas (Jansen *et al.,* 2012; Lynam *et al.,* 2013) and is being investigated for the Irish Sea (Figure 5.11). Increases in gelatinous zooplankton have also been noted linked to climatic changes, most notably SST (Lynam *et al.,* 2011). Combined these species may be having impacts on the zooplankton community and higher trophic levels through predation on early life-history stages, leading to reduced recruitment (Plirú *et al.,* 2012).

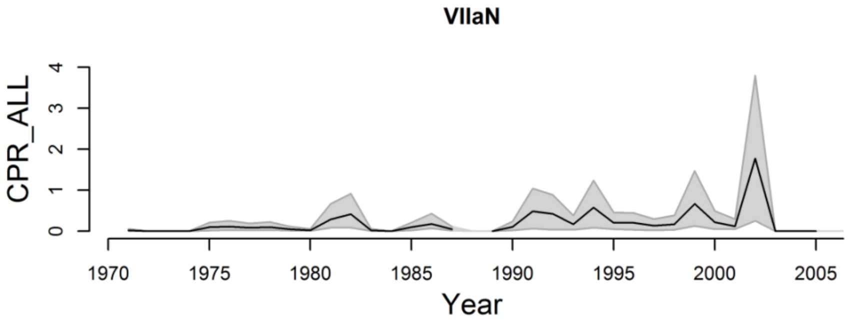

Figure 5.11. Mean *Clupeidae* spp. larvae from CPR for Irish Sea 1971–2005 (excluding 1988). Estimates of mean abundance (black line) with 95% confidence intervals from bootstrap interactions by sampling with replacement from data 1001 times (grey shaded areas)

Reporting and evaluation of developing indicators throughout the region has also taken place related to the assessment of GES and MSFD.

Integrated Ecosystem Assessment of the Gulf of Cadiz

Further work in the Gulf of Cadiz (GoC) has been undertaken to identify important drivers of recruitment success in local anchovy nursery grounds. The most prominent ecological feature in the region is the Guadalquivir estuary (GE), which drains one of the major European river catchments areas. The GE serves as nursery ground for several commercial species, of which anchovy is the most emblematic. This nursery function is the main regulating service it provides when it comes to the GoC fisheries.

As a short-lived small pelagic species, anchovy recruitment is strongly affected by year-to-year fluctuations in the environmental conditions (temperature, winds, productivity), which cannot be managed. The nursery ground of the GE is therefore considered important as the pressures affecting its condition may be directly managed.

The GE is greatly affected by human activities such as shipping, agriculture, dredging or mining. The GE is part of the Doñana National Park, which is also listed as UNESCO world heritage site and biosphere reserve. It is also embedded in the 'Guadalquivir mouth' Marine Protected Area. Two EU Directives, the Water Framework (WFD) and the Marine Strategy Framework Directive (MSFD), protect the marine and transitional water bodies.

As well as the EU jurisdiction and categories of protection listed above, there are local levels of decision-making actors with potentially conflicting interests, such as the Confederación Hidrográfica del Guadalquivir, responsible for the river management, or the Junta de Andalucía, local government responsible for Guadalquivir mouth MPA.

Fishers, scientists, irrigators, conservationists, mining, aquaculture industry, and tour operators' interests all meet in the Guadalquivir estuary. Located in one of the most deprived Spanish regions, with the highest unemployment rate in the entire EU (> 30%), the GoC has a clear stake in operationalizing an Ecosystem Approach capable of balancing the various political, economic and conservation interests and by doing so taking advantage of the Blue Growth opportunities.

The study therefore highlights the importance of having knowledge of local habitats and processes in the management of economically important fishery resources and the complexity in managing those resources within the legislative and socio-economic environment. The group considered the GoC as a useful case study area for further investigation of EBFM.

5.3 ToR c) Summarize and update the regional Ecosystem overviews

Ecosystem overviews have been published in 2016 both for the Celtic Seas and for the Bay of Biscay and Iberian waters (http://www.ices.dk/community/advisory-process/Pages/Ecosystem-overviews.aspx). The work of the group has contributed extensively to the development of these documents. These were reviewed during the meeting and the group will continue to advise on their content and structure.

During this meeting, the group has carefully revised these two documents, and some specific recommendations have been provided:

- Consistency in graphs, terminology, and 'other' pressures. North Sea and Barents Sea have combined substratum loss and smothering into a single pressure that is listed as two separate pressures in Celtic Seas and BoBIP, and in the ICES glossary. All ecosystem overviews also have different numbers of pressures (NS 7, with 4 top, BoBIP 8 with 5 tip, CS = 5, Barents Sea = 7).
- Avoid 'pet' statements that can be misconstrued as a very important statement when other pressures are not explained at all. We suggest the 'other' pressures (those outside the top 5) should have a single sentence or bullet point (similar to the BoBIP/Barents Sea overview), and consider highlighting how they interact with the ecological characteristics.
- For instance, for the Celtic Seas, marine noise is not in the top 5 pressures, so instead under the 'other pressures' heading something like the below would appear for each of the other pressures:

  > Marine Noise is caused by aggregates, coastal infrastructure, fishing, shipping, tourism and recreation, military operations, navigational dredging, construction of renewables and non-renewables, telecommunications, research and harvesting/collecting activities. Marine noise is most problematic for marine mammals, seabirds, and fish.

- Climate change should be mentioned in the report, but without a major focus as it is not manageable at the level of the ecosystem.
- Continue to build links with other groups for input on specific elements (climate change, zooplankton, birds, etc.).
- Headings on figures need to be clarified. Figure for ODEMM needs to be highlighted as being the top five pressures only, and the surface and subsurface maps need to have the same scale, or have it explicitly mentioned in the figure heading that they are different scales.
- We recommend that the 'Potential pressures arising from increased anthropogenic activity' section is included in all overviews.

5.4 ToR d) Identify ecosystem trends relevant to stock assessment and management and report these accordingly

One contribution was presented under ToR d, aiming at highlighting the need of using holistic approaches to identify ecosystem trends that might be relevant to the assessment of the stock dynamics and so, to the proper management of the commercial stocks. This study shows how what *a priori* would be the basis of the sustainable management of the stocks based on a single-species approach, could negatively affect other species which are somehow dependant or linked to others.

Analysing the effects of the implementation of the Landing Obligation at an ecosystem level: the case of the Bay of Biscay

The need of using more holistic (ecosystem-based) approaches is recognized by both the Marine Strategy Framework Directive (MSFD) and the last reform of the Common Fisheries Policy (CFP). Understanding ecosystem dynamics in a context of global change is one of the challenges of an integrated assessment of marine systems. Recent incorporation of the landing obligation (discard ban) in the CFP requires an ecosystem based analysis of it, aiming at assessing the potential effects of its implementation at an ecosystem scale. We present that for the Bay of Biscay ecosystem. Ecosystem models have been proposed as useful tools to explore that. In this case, the Ecopath with Ecosim (EwE) modelling approach is used, in order to establish a framework for implementing the Ecosystem Based Fisheries Management (EBFM) in the Bay of Biscay ecosystem. Different management strategy scenarios were forward simulated, including the business-as-usual (stocks fished at their maximum sustainable yield (MSY) level) and the landing obligation (no allowance of discarding practices) scenarios. Direct and indirect effects of the implementation of the landing obligation on the dynamics of the ecosystem components at different trophic levels have been quantified, but also some changes in the ecosystem properties have been found. It is concluded that the total output of the system is likely to increase under the Landing Obligation scenario, but that the system will be less capable of eliminating the effects of the perturbations. It also has been obtained that the mean trophic level of the overall removals due to fishing is not likely to change, but some changes in the relative abundance of each species or functional group might happen. This is for example the case of seabirds and *Nephrops*, which are likely to be less abundant under the Landing Obligation scenario, while hake and dolphins will increase their presence in the Bay of Biscay ecosystem.

All this work is already been prepared for publication and expected to be available for the next meeting.

6 Cooperation

6.1 Cooperation with other WG

- Back to back meetings with WGINOSE, Lisbon, Portugal, 2013 and WGIAB, Cadiz, Spain, 2015
- Expert advice to the WKIrish benchmark process

6.2 Cooperation with Advisory structures

Ecosystem Overviews

6.3 Cooperation with other IGOs

WWF-UK

During the 2016 meeting, Jenny Oates from WWF-UK gave an overview of the Celtic Seas Partnership project. The Celtic Sea Partnership is a 4-year EC Life+ funded project (2013–2016) led by WWF-UK. The project is supporting transboundary implementation of the Marine Strategy Framework Directive in the Celtic Seas through the ecosystem approach. The project focuses on engaging with a wide range of stakeholders and has so far engaged with over 750 marine stakeholders from 22 sectors. The project is producing a number of products that will be available in summer 2016, including:

- Future Trends report highlighting the possible Future Trends in the Celtic Seas over the next 20 years and the impacts on environment, economy, jobs etc.
- Best practice guidelines on Transboundary marine governance, co-location of marine renewables, and conflict resolution, based on case studies and stakeholder input from across the Celtic Seas countries.
- Celtic Seas web portal providing signposting to a catalogue of datasets and library of information relevant to MSFD in the Celtic Seas.
- Stakeholder initiatives being taken forwards by Task groups in three areas: Marine Litter (Eco-schools programme), Biological diversity (Engaging fisheries in monitoring) and Non-indigenous species (Celtic Seas scale biosecurity protocol).

The Celtic Seas Partnership is now in its final year and is focusing on securing a lasting legacy for the project. WWF-UK looks forward to working with WGEAWESS and other relevant ICES working groups to support the application of the project outputs more widely and in other areas outside the Celtic Seas; Anyway, this is still under discussion.

7 Summary of Working Group self-evaluation and conclusions

1) **Working Group name:** WGEAWESS – Working Group on Ecosystem Assessment of the Western European Shelf Seas

2) **Year of appointment:** 2013

3) **Current Chairs:** Steven Beggs (AFBI) and Eider Andonegi (AZTI)

4) Venues, dates and participants per meeting:

- WGEAWESS 2014 –Webex conference (7 participants)
- WGEAWESS 2015 - Universidad de Cádiz (Spain). 9–13 March, 2015 (15 participants +2 participants by WebEx).
- WGEAWESS 2016 – AFBI (Belfast, UK). 14–18 March, 2016 (6 participants + 3 participants by WebEx).

WG Evaluation

5) If applicable, please indicate the research priorities (and sub priorities) of the Science Plan to which the WG make a significant contribution.

We made progress in all priority areas related to the

- Definition of appropriate subregions within the Western Shelf Seas based on geographical, biological, and oceanographic criteria.
- Production of subregional fully configured ecosystem overviews for the above regions, used for the final ecoregion overviews.
- Compilation of relevant time-series of ecological, environmental, biological, and fishery related variables.
- Trends in fishing pressure, mean maximum length and LFI developed in three areas of the Western waters.
- Analysis of Climate trends in the Celtic Seas.
- Proposed indicators to assess GES in pelagic habitats for descriptors D1 and D4 based on plankton components - NW and N Spanish shelf.
- Identify objectives for a holistic IEA in relation to ecosystem stability and health, according to ecological, social, and economic sustainability goals, and recognizing multi-scale issues.
- Identify issue-based ecosystem questions, that can be provided by the development of IEA, relevant to science and management needs.
- Provide priorities and specifications for data collection frameworks supporting IEAs.
- Conduct pilot studies in data-rich areas for alternative IEA approaches, linking qualitative and quantitative methods at appropriate spatial and temporal scales.
- Determine and demonstrate what modelling and analytical approaches would allow projections for ecosystem state in IEA.
- Use of IEA to assist in the management of cumulative pressures, additive and non-additive impacts, including analysis of trade-offs between sectoral objectives, and the inclusion of risk evaluations.
- Comparisons of IEA and single-issue approaches for their utility to inform management and governance advice on sectoral and multi-sectoral use of the oceans.

6) **In bullet form, list the main outcomes and achievements of the WG since their last evaluation. Outcomes including publications, advisory products, modelling outputs, methodological developments, etc.**

- ODEMM approach was applied to the Celtic Seas and Irish Sea.
- ITAs were used to preliminary assess the Irish Sea and the Gulf of Cadiz.
- Ecosystem models have been used in the Bay of Biscay and the Gulf of Cadiz: Ecopath with Ecosim (EwE) tool has been selected for that in both cases.
- Ecosystem overviews were produced for the Celtic Seas and Bay of Biscay and Iberian waters ecoregions.
- Statistical modelling of the role of the Guadalquivir estuary as a nursery area for anchovy.
- Presentation of the work developed by the group at the ICES ASC in 2014

7) **Has the WG contributed to Advisory needs? If so, please list when, to whom, and what was the essence of the advice.**

- Ecosystem overviews were produced for CS and BoB-Iw ecoregions.
- Providing support and input to WKIrish - ongoing.
- Ecosystem considerations for stock assessment groups when needed.

8) **Please list any specific outreach activities of the WG outside the ICES network (unless listed in question 6). For example, EC projects directly emanating from the WG discussions, representation of the WG in meetings of outside organizations, contributions to other agencies' activities.**

- Presentation of the work developed by the group to NGOs (WWF), social scientist from the University of Seville, and the Southwestern Waters Advisor Council.

9) **Please indicate what difficulties, if any, have been encountered in achieving the workplan.**

- Lack of funding at national level has affected participation of delegates at meetings. It is important that countries involved in WGEAWESS provide enough human resources.

Future plans

10) **Does the group think that a continuation of the WG beyond its current term is required? (If yes, please list the reasons)**

Yes, we still have lot of work in progress that it will be worth continuing. The development of IEAs is at its infancy and the groups need to do much effort in that direction.

11) **If you are not requesting an extension, does the group consider that a new WG is required to further develop the science previously addressed by the existing WG.**

NA

12) **What additional expertise would improve the ability of the new (or in case of renewal, existing) WG to fulfil its ToR?**

We are trying to get economist and social scientists and also more stakeholder involvement in the group. Some interaction with WGRMES and also stock assessment groups would also be interesting.

13) **Which conclusions/or knowledge acquired of the WG do you think should be used in the Advisory process, if not already used? (please be specific)**

Ecosystem overviews are the main contribution from this group to the Advice.

Reference

Alheit, J., Licandro, P., Coombs, S., Garcia, A., Giráldez, A., Santamaría, M. T. G., Slotte, A., et al. 2014. Reprint of "Atlantic Multidecadal Oscillation (AMO) modulates dynamics of small pelagic fishes and ecosystem regime shifts in the eastern North and Central Atlantic". Journal of Marine Systems, 133: 88-102.

Allen, J. R., Slinn, D. J., Shammon, T. M., Hartnoll, R. G., and Hawkins, S. J. 1998. Evidence for eutrophication of the Irish Sea over four decades? Limnology and Oceanography, 43: 1970-1974.

Armstrong, M. J., Dickey-Collas, M., McAliskey, M., McCurdy, W. J., Burns, C. A., and Peel, J. A. D. 1999. The distribution of anchovy Engraulis encrasicolus in the northern Irish Sea from 1991 to 1999. Journal of the Marine Biological Association of the UK, 79: 955-956.

Beaugrand, G. 2003. Long-term changes in copepod abundance and diversity in the north-east Atlantic in relation to fluctuations in the hydroclimatic environment. Fisheries Oceanography, 12: 270-283.

Beaugrand, G. 2004. The North Sea regime shift: Evidence, causes, mechanisms and consequences. Progress in Oceanography, 60: 245-262.

Beaugrand, G. 2009. Decadal changes in climate and ecosystems in the North Atlantic Ocean and adjacent seas. Deep Sea Research Part II: Topical Studies in Oceanography, 56: 656-673.

Beaugrand, G., Brander, K. M., Lindley, J. A., Souissi, S., and Reid, P. C. 2003. Plankton effect on cod recruitment in the North Sea. Nature, 426: 661-664.

Beaugrand, G., Reid, P. C., Ibanez, F., Lindley, J. A., and Edwards, M. 2002. Reorganization of North Atlantic marine copepod biodiversity and climate. Science, 296: 1692-1694.

Cannaby, H., and Hüsrevoğlu, Y. S. 2009. The influence of low-frequency variability and long-term trends in North Atlantic sea surface temperature on Irish waters. ICES Journal of Marine Science: Journal du Conseil, 66: 1480-1489.

Diekmann, R., and Möllmann, C. 2010. Integrated ecosystem assessments of seven Baltic Sea areas covering the last three decades. ICES Cooperative Research Report. 90 pp pp.

Diekmann, R., Otto, S., and Möllmann, C. 2012. Towards Integrated Ecosystem Assessments (IEAs) of the Baltic Sea: Investigating Ecosystem State and Historical Development. In Climate Impacts on the Baltic Sea: From Science to Policy, pp. 161-199. Springer.

Gowen, R. J., Hydes, D. J., Mills, D. K., Stewart, B. M., Brown, J., Gibson, C. E., Shammon, T. M., et al. 2002. Assessing Trends in Nutrient Concentrations in Coastal Shelf Seas: a Case Study in the Irish Sea. Estuarine, Coastal and Shelf Science, 54: 927-939.

Gowen, R. J., Tett, P., Kennington, K., Mills, D. K., Shammon, T. M., Stewart, B. M., Greenwood, N., et al. 2008. The Irish Sea: Is it eutrophic? Estuarine, Coastal and Shelf Science, 76: 239-254.

Heath, M. R., and Lough, R. G. 2007. A synthesis of large-scale patterns in the planktonic prey of larval and juvenile cod (Gadus morhua). Fisheries Oceanography, 16: 169-185.

ICES. 2013. Report of the Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS). ICES CM 2013/SSGRSP:02. 159 pp.

ICES. 2015. First and Second Interim Reports of the Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS). ICES CM 2015/SSGIEA:02. 32 pp.

Jansen, T., Kristensen, K., Payne, M., Edwards, M., Schrum, C., and Pitois, S. 2012. Long-Term Retrospective Analysis of Mackerel Spawning in the North Sea: A New Time Series and Modeling Approach to CPR Data. PLoS ONE, 7: 1-10.

Lynam, C. P., Halliday, N. C., Höffle, H., Wright, P. J., van Damme, C. J. G., Edwards, M., and Pitois, S. G. 2013. Spatial patterns and trends in abundance of larval sandeels in the North Sea: 1950–2005. ICES Journal of Marine Science: Journal du Conseil, 70: 540-553.

Lynam, C. P., Lilley, M. K. S., Bastian, T., Doyle, T. K., Beggs, S. E., and Hays, G. C. 2011. Have jellyfish in the Irish Sea benefited from climate change and overfishing? Global Change Biology, 17: 767-782.

McGinty, N., Power, A. M., and Johnson, M. P. 2011. Variation among northeast Atlantic regions in the responses of zooplankton to climate change: Not all areas follow the same path. Journal of Experimental Marine Biology and Ecology, 400: 120-131.

Petitgas, P., Alheit, J., Peck, M. A., Raab, K., Irigoien, X., Huret, M., Van Der Kooij, J., et al. 2012. Anchovy population expansion in the North Sea. Marine Ecology-Progress Series, 444: 1-13.

Pitois, S. G., and Fox, C. J. 2006. Long-term changes in zooplankton biomass concentration and mean size over the Northwest European shelf inferred from Continuous Plankton Recorder data. ICES Journal of Marine Science: Journal du Conseil, 63: 785-798.

Plirú, A., van der Kooij, J., Engelhard, G. H., Fox, C. J., Milligan, S. P., and Hunter, E. 2012. Sprat feeding behaviour, selective predation, and impact on plaice egg mortality. ICES Journal of Marine Science: Journal du Conseil, 69: 1019-1029.

Richardson, A. J., Walne, A. W., John, A. W. G., Jonas, T. D., Lindley, J. A., Sims, D. W., Stevens, D., et al. 2006. Using continuous plankton recorder data. Progress in Oceanography, 68: 27-74.

Wanless, S., Harris, M., Redman, P., and Speakman, J. 2005. Low energy values of fish as a probable cause of a major seabird breeding failure in the North Sea. Marine Ecology Progress Series, 294: 8.

Annex 1. List of participants

Name	Institute Address	E-mail
David Reid	Marine Institute Rinville, Oranmore, Co. Galway. Ireland	david.reid@marine.ie
Debbi Pedreschi	Marine Institute Rinville, Oranmore, Co. Galway. Ireland	debbi.pedreschi@ marine.ie
Eider Andonegi (chair)	AZTI Txatxarramendi ugartea z/g E-48395 Sukarrieta (Bizkaia) Spain	eandonegi@azti.es
Jenny Oates	WWF-UK	Joates@wwf.org.uk
Marcos Llope	IEO- Instituto Español de Oceanografia.	marcos.llope@cd.ieo.es
Maria de Fatima Borges (via Skype)	IPMA- Instituto Português do Mar e da Atmosfera Av Brasilia 1449-006 Lisboa Portugal	mfborges@ipma.pt
Pascal Laffargue (via Skype)	Ifremer - Centre de Nantes Département EMH (Ecologie et Modèles pour l'Halieutique) rue de l'Ile d'Yeu B.P. 21105 44311 Nantes Cedex 03 France	Pascal.laffargue@ifremer.fr
Sigrid Lehuta (via skype)	Ifremer - Centre de Nantes Département EMH (Ecologie et Modèles pour l'Halieutique) rue de l'Ile d'Yeu B.P. 21105 44311 Nantes Cedex 03 France	Sigrid.Lehuta@ifremer.fr
Steven Beggs (chair)	Agri-Food and Biosciences Institute Newforge Lane Belfast, BT 9 5PX Northern Ireland, UK	Steven.beggs@afbini.gov.uk

Annex 2. Recommendations

RECOMMENDATION	ADRESSED TO
1. Attending members of the WGEAWESS meeting in Belfast 18–25 March 2016 recommended that the WG should continue for another 3-year period within the ICES system. New ToRs are proposed in Annex 3.	SCICOM and ACOM

Annex 3. WGEAWESS Terms of reference (2017–2019)

The **Working Group on Ecosystem Assessment of Western European Shelf Seas** (WGEAWESS) chaired by Steven Beggs, UK and Eider Andonegi, Spain, will meet in Lisbon, Portugal, on 20–24 March 2017 to work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2017	20-24 March	Lisbon, Portugal	Interim report by 30 April to SSGIEA	
Year 2018	Mid-March	TBC	Interim report by 30 April to SSGIEA	
Year 2019	Mid-March	TBC	Interim report by 30 April to SSGIEA	Change in Chairs for third meeting

ToR descriptors

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
a	Continue metadata compilation for all ecosystem components available for IEA development	Process initiated and completed for specific subregions in previous ToR. Other subregions in draft.	4.3	3 years, progress updated annually	Database linked to ICES for Regional Sea Programmes
b	Continue evaluation of data and trends for a regional Integrated Ecosystem Assessment. Identify ecosystem trends relevant to stock assessment and management	Linked to WKECOVER, WKRISCO, WKDECOVER, and the commitment to provide advice in the context of EBAFM	4.2, 4.1	3 years	Report IEAs and provide advice to fisheries groups as appropriate
c	Review and update the regional Ecosystem overviews	Linked to ACOM-SCICOM advice	4.2	3 years	Ecosystem overviews
d	Develop and apply ecosystem models to fill identified gaps in empirical data for use in IEAs	This would be linked to activities conducted under previous ToRs	4.1	3 years	Regional modelling prodcuts
e	Development of Interreg Atlantic Area proposal	Funding is being sought to increase the resources and participation of the group		1 year	Successful fund capture

Summary of the Work Plan

Year 1	The main task will be the development of a proposal for Interreg funding. the group

	will also be involved with providing advice to WKIrish. We will continue to identify and catalogue datasets available that would be potentially valuable in an iea and EBAFM. Ongoing analysis of important trends in ecosystem indicators. Improve communication with relevant advice groups (fisheries stock assessment).
Year 2	Continue with Year 1 activities while liaising with relevant ICES WG membership. Development of ecosystem models to fill identified gaps in empirical data for use in IEAs. Scope of IEA and model development will be dependent on successful Interreg funding.
Year 3	Continue with Year 2 activities while liaising with relevant ICES WG membership. Development of ecosystem models to fill identified gaps in empirical data for use in IEAs. Scope of IEA and model development will be dependent on successful Interreg funding.

Supporting information

Priority	Heavy pressure on shelf seas (biodiversity loss, climate changes, fisheries), lack in understanding of large marine ecosystem functioning and the context of ecosystem health indicators development for the Marine Strategy Framework Directive require to address those research topics at the relevant scale i.e. the regional approach. The EAWESS working group will focus on North Atlantic European continental shelf. Regional area of interest includes the Celtic Seas (Celtic Sea, Irish Sea, West of Scotland, Western English Channel), Bay of Biscay (French continental shelf, Cantabrian Sea) and Western Iberia (Iberian Upwelling, Gulf of Cadiz), involving five countries (Ireland, UK, France, Spain and Portugal). The choose of such limits is justified by : • bio-geographical (transitional region between subtropical and Subarctic gyres) • chemo-physical continuum: large opened and connected areas dominated by soft bottom, closely linked by regional ocean circulation process, offering 'coast-shelf-slope' and latitudinal environmental gradient • management unit (ICES, OSPAR) already existing scientific networks (e.g. IBI-ROOS)
Resource requirements	There is no resource implication for ICES. Working group program is based on synthesis of data and results from existing scientific program, and coordination of surveys and observations networks. However, involvement of ICES data center would useful to help with sharing and harmonizing data.
Participants	The Group is normally attended by some 8 members plus guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	Direct link to IEA, ACOM-SCICOM advice.
Linkages to other committees or groups	There is a very close working relationship with all the groups of SSGIEA. It is also very relevant to the Working Group on WGECO ,WGSAM, WKIrish, WGRMES and WGMSFDemo
Linkages to other organizations	DC- MAP- DG MARE, MSFD DG ENV, OSPAR, WWF

Annex 4: Metadata compilation

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
1	Abiotic	North Atlantic Oscillation	Index	All		winter	djfm	1865-		obs		https://climatedataguide.ucar.edu/climate-data/hurrell-north-atlantic-oscillation-nao-index-station-based
2	Abiotic	North Atlantic Oscillation	Index	All			monthly	1865-		obs		https://climatedataguide.ucar.edu/climate-data/hurrell-north-atlantic-oscillation-nao-index-station-based
3	Abiotic	Eastern Atlantic Pattern	Index	All				1950-		obs		http://www.cpc.ncep.noaa.gov/data/teledoc/ea.shtml
4	Abiotic	Air temperature anomalies	°C	8c				1950-	meteorological stations	obs		http://www.aemet.es
5	Abiotic	Accumulated precipitation anomalies	mm/ month	8c			monthly	1950-	meteorological stations	obs		http://www.aemet.es
6	Abiotic	Upwelling index	Index	8c				1967-		obs		
7	Abiotic	surface chlorophyll		Global	8c					Obs/ Models	MODIS-Aqua	http://oceancolor.gsfc.nasa.gov/cms/
8	Abiotic	sea level	mm	8c				1943-		obs		
9	Abiotic	Sea Surface temperatue		8c				1980s		obs		Reymolds *et al.*, 2002
10	Abiotic	Sea Surface temperatue		8c					NCEP/NCAR	Obs/ Models	Obs/Models	
11	Abiotic	SST,Sal,nutrients						1987-	RADIALES	obs		IEO
12	Abiotic	River run-off					monthly			obs	stations	Confederación hidrográfica
13	Abiotic	Oxygen	% Sat.	8c	NIS	spring	annual	2000-	Pelacus survey	obs	Winkler and/or oxygen sensor	IEO
14	Biotic	picoplankton/detritus	cells ml^{-1}	8c	NIS	spring	annual	2002-	Pelacus survey	obs	Niskin bottles/ flow citometry	IEO
15	Biotic	picoplankton/detritus	cells ml^{-1}	8c	NIS		monthly	2002-	RADIALES	obs	Niskin bottles/ flow citometry. 2 sections along NIS (Coruña and Gijón). Discrete depth	IEO
16	Biotic	phytoplankton,zooplantkon, ichthyoplankton	cells ml^{-1}	8c	NIS		monthly	1987-	RADIALES	obs	Niskin bottles/ flow citometry. 2 sections along NIS (Coruña and Gijón). Discrete depth	IEO
17	Biotic	phytoplantkon	μgl^{-1}	8c	NIS	spring	annual	1987-	Pelacus survey	obs	fluorescence ca. 5 nm across shelf x 18 nm alongshelf. Vertical	IEO
18	Biotic	phytoplantkon	μgl^{-1}	8c	NIS		monthly	1990-		obs	fluorescence 5 sections along NIS. Vertical	IEO
19	Biotic	phytoplantkon	μgl^{-1}	8c	NIS		monthly	1990-		obs	Analytical chlorophyll	
20	Biotic	phytoplantkon					weekly			obs	Satellite	NOAA
21	Biotic	phytoplantkon	cells m^{-2}	8c	NIS	spring	annual	1990-	Pelacus survey	obs		IEO
22	Biotic	phytoplantkon species composition	cells m^{-2}	8c	NIS	spring	annual	1990-	Pelacus survey	obs		IEO
23	Biotic	phytoplantkon species composition	cells m^{-2}	8c	NIS	spring	annual	2005-	Pelacus survey	obs	Niskin bottles, flow CAM	IEO
24	Biotic	phytoplantkon species composition	cells m^{-2}	8c	NIS		monthly	1990-	RADIALES	obs	Niskin bottles, uthermol. 5 sections along NIS. Discrete depths	IEO
25	Biotic	zooplankton	mg m^{-2}	8c	NIS	spring	annual	1990-	Pelacus survey	obs	WP2 nets. Dry-weigh biomass (size-fractionated)	IEO
26	Biotic	zooplankton	mg m^{-2}				monthly	1990-	RADIALES	obs	WP2 nets. Dry-weigh biomass (size-fractionated). 5 sections along NIS. Depth integrated	IEO
27	Biotic	zooplankton	ind. m^{-3}	8c	NIS		monthly	1992-	RADIALES	obs	WP2 nets. Species composition. 5 sections along NIS. Depth integrated	IEO
28	Biotic	zooplankton		8c, 9a	F4, E4		monthly	1960-	SAHFOS	obs	CPR	https://www.sahfos.ac.uk/

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
29	Biotic	zooplankton size structure		8c	NIS	spring	annual	2005-	Pelacus survey	obs	WP2 nets, zooscan ca. 5 nm across shelf x 18 nm alongshelf. Depth integrated	IEO
30	Biotic	zooplankton	ind. m^{-3}	8c	NIS		monthly	2005-	RADIALES	obs	WP2 nets. Zooscan. 5 sections along NIS. Depth integrated	IEO
31	Biotic	fish eggs								obs		
32	Abiotic	nitrate		8c						obs		Nogueira *et al.*,2012
33	Biotic	autotrophic picoplankton	mg C m^{-2}	8c				2002-		obs		Morán *et al.*, 2012
34	Biotic	heterotrophic picoplankton	mg C m^{-2}	8c				2002-		obs		Morán *et al.*, 2012
35	Biotic	chlorophyll	mg C m^{-2}	8c				1998–2007	SeaWiFS	obs	Water column integrated	Bode *et al.*, 2011; Bode *et al.*, 2012a
36	Biotic	Primary production	mg C m^{-2}	8c				1993-2008		obs	14C incubation method	Bode *et al.*, 2011; Bode *et al.*, 2012a
37	Biotic	phytoplankton	cells/L	8c				1980s		obs		Velasco *et al.*, 2012; Varela *et al.*, 2012
38	Biotic	phytoplankton		8c, 9a	F4, E4		monthly	1960-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
39	Biotic	diatoms	cells/L	8c				1980s-		obs		Velasco *et al.*, 2012; Varela *et al.*, 2012
40	Biotic	dinoflagellates	cells/L	8c				1980s-		obs		Velasco *et al.*, 2012; Varela *et al.*, 2012
41	Biotic	zooplankton	ind/m^3	8c				1991-		obs		Velasco *et al.*, 2012; Bode *et al.*, 2012b
42	Biotic	Ichthyoplankton	ind/m^3	8c	NIS		monthly	1990-	RADIALES	obs	Bongo net. 5 sections along NIS. Discrete depths	IEO
43	Biotic	fish eggs	ind/m^3	8c	NIS	spring	annual	2002-	Pelacus	obs	Bongo net, Calvet, CUFES	IEO
44	Biotic	Sardine landings	tonnes	8c, 9a				1940's-	ICES WGHANSA	obs		
45	Biotic	Sardine Spawning-stock biomass	SSB	8c, 9a				1984-	ICES WGHANSA	obs		
46	Biotic	Mackerel abundance	inds x10^6	8c, 9a				2001-	ICES WGACEGG	obs		
47	Biotic	anchovy catch	tonnes	8				1980s-		obs		
48	Biotic	anchovy SSB	tonnes	8				1980s-	ICES WGHANSA, WGACEGG	obs	DEPM,Acoustic	
49	Biotic	albacore catch	tonnes	North Atlantic stock				1930-	ICCAT, 2010	obs	by Gear	http://www.iccat.int/en/
50	Biotic	Demersal fish biomass index	kg/trawl	8	NIS	Autumn		1988-	Demersales' survey	obs	Bottom trawl	IEO
51	Biotic	Pelagic fish biomass	tonnes	8	NIS	spring		1990-		obs	Acoustic For sardine since 1990. For mackerel and horse mackerel since 2000. The whole pelagic com-munity since 2007. Reanalysis of echograms in progress.	IEO
52	Biotic	invertebrates Index	kg/trawl	8	NIS			1990-	Demersales' survey	obs	Bottom trawl	IEO
53	Biotic	macroalgal	geographical spread	8				1980s-		obs		Fernández, 2011
54	Biotic	seabirds	No. Ind.	8	NIS	Autumn, spring		2003-	surveys	obs		IEO
55	Biotic	seabirds	No. Ind.	8	Central Cantabrian Sea		monthly	2007–2009	RADIALES	obs	5 sections along NIS. Discrete depths	UIOVI-IEO

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
56	Biotic	seabirds								obs		Arcos *et al.*,2012
57	Biotic	mammals	No. Ind.	North Atlantic stock				1994-2005		Obs/ Models	Obs/Models	
58	Biotic	mammals	No. Ind.			Autumn, spring		2007-	Pelacus	obs	Survey	IEO
59	Biotic	mammals	No. Ind.	8	Galician coast		Monthly	2004-2007		obs	Coastal Obs	IEO
60	Biotic	mammals	No. Ind.	8				1990-		obs	Strandings	IEO
61	Pressures	Dredging	miles de m^3	8				1990-		obs		Capote *et al.*, 2012
62	Pressures		hours							obs		Capote *et al.*, 2012
63	Abiotic	Mean north wind	m/s	9a		winter	jfm	1899-	NCAR, reanalysis data ((5°x5° grid 30-50°N, 25-5°W with centre 40°N and 10°W	obs		courtesy of A.M. Santos, IPMA
64	Abiotic	Sea Surface temperatue	°C	9a				1960-		obs	ICOADS (reanalysis 2°x2° grid data). Portugal (39.5°N,9.5°W)	Courtesy of A.M. Santos, IPMA
65	Biotic	primary production		9a						obs		
66	Biotic	Mesozooplankton mean abundance	ml/m^3	9a				2005–2011		obs	CUFES Continuos Underway Fish Egg Sampling	courtesy of M. Angélico, IPMA
67	Biotic	exploited species	tons	8c	NIS		monthly	1983-	Observation	obs	By harbour, fishing gear and species	IEO
68	Abiotic	Sea Surface Temperature	°C	8a,b	BoB contential shelf	s,a	annual	1987-	Scientific Surveys (Pelgas, Evhoe)	obs	CTD	Ifremer
69	Abiotic	Temperature	°C	8a,b,h,e,d	BOB, Celtic Sea, English Channel		Monthly	1862–2006	BOBYCLIM	obs	CTD/data intregration	Ifremer
70	Abiotic	various	°C	8a,b	BoB, contential shelf		3 days	1970s-	MARS3D	m	model	Ifremer
71	Abiotic	Salinity		8a,b	BoB, contential shelf	s,a	annual	1987-present	Scientific Surveys (Pelgas, Evhoe)	obs	CTD	Ifremer
72	Abiotic	River Run-off		8a,b,e,d						obs	fixed stations	French water agency
73	Abiotic	Meterology								obs	fixed stations	French meteorological agency
74	Biotic	Bentho-demersal fish and commercial crusta-ceans and cephalopods	abundance and biomass	8a,b,h,e,d	BoB, contential shelf, Celtic Sea	a	annual	1990-	EVHOE survey, 70 stations BoB, 70 stations Celtic Sea	obs	GOV (4 m vertical opening and 20 mm codend mesh size)	Ifremer
75	Biotic	Nusery grounds biomass and abundance		8a,b	BOB, Bay and estuary	sum	annual	1980-	NURSE	obs	Beam trawl	
76	Biotic	small pelagic fisheries	species abundance and biomass	8a,b	BoB, contential shelf	spr	annual	2000-	PELGAS Acoustic survey	obs	systematic transect sampling design	Ifremer
77	Biotic	Phytoplankton	species abundance	8a,b	BoB, contential shelf	spr	irregular	irregular	PELGAS Acoustic survey	obs	Net 200 µm	

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
78	Biotic	zooplankton	size spectrum	8a,b	BoB, contential shelf	spr		2003-	PELGAS Acoustic survey	obs	Optical plankton recorder	
79	Biotic	zooplankton	species abundance	8a,b	BoB, contential shelf		monthly	1958–1995	CPR	obs		SAHFOS
80	Abiotic	Sea Surface temperature	°C	7aN	Cypris 54 05.50N, 04 50.00W	Annual	monthly	1954-	IOM Gov	obs	insulated thermometer	
81	Abiotic	Sea surface salinity	psu	7aN	Cypris 54 05.50N, 04 50.00W	Annual	monthly	1954-	IOM Gov	obs		
82	Abiotic	Dissolved oxygen		7aN	Cypris 54 05.50N, 04 50.00W	Annual	monthly	1954-	IOM Gov	obs		
83	Abiotic	Inorganic nitrogen		7aN	Cypris 54 05.50N, 04 50.00W	Annual	monthly	1960-	IOM Gov	obs		
84	Abiotic	Inorganic phosphate		7aN	Cypris 54 05.50N, 04 50.00W	Annual	monthly	1954-	IOM Gov	obs		
85	Abiotic	Inorganic silica		7aN	Cypris 54 05.50N, 04 50.00W	Annual	monthly	1958-	IOM Gov	obs		
86	Biotic	Chlorophyll a		7aN	Cypris 54 05.50N, 04 50.00W	Annual	monthly	1966-	IOM Gov	obs		
87	Abiotic	SST	°C	7aN	VIIAN1° latitude-longitude grid	Annual	monthly	1870-	UK Met Office	obs	Hadley Centre Sea Ice and Sea surface Temperature dataset	http://www.metoffice.gov.uk/hadobs/hadisst/data/download.html
88	Abiotic	NAO		7aN		winter	djfm	1865-		obs		https://climatedataguide.ucar.edu/climate-data/hurrell-north-atlantic-oscillation-nao-index-station-based
89	Abiotic	wNAO		7aN				1865-		obs		https://climatedataguide.ucar.edu/climate-data/hurrell-north-atlantic-oscillation-nao-index-station-based
90	Abiotic	AMO		7aN			monthly	1948-		obs		http://www.esrl.noaa.gov/psd/data/correlation/amon.us.data
91	Abiotic	AO		7aN			monthly	1950-		obs		
92	Abiotic	HAD_rainfall		7aN			monthly	1931-	UK Met Office	m		http://www.metoffice.gov.uk/hadobs/hadukp/data/download.html
93	Abiotic	CODAS_wind_ano		7aN			monthly	1960-		m		
94	Abiotic	NH SST anomalies_HADSST3		7aN				1850-		m		www.cru.uea.ac.uk/cru/data/temperature/HadSST3-nh.dat
95	Biotic	phytoplankton colour index	per.m.3	7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
96	Biotic	dinoflagellates		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
97	Biotic	diatoms		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
98	Biotic	Cnidaria Tissue		7aN	53N to 54.5N, 3W to 7W			1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
99	Biotic	*Acartia* spp.		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
100	Biotic	*Pseudocalanus elongatus* spp.		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
101	Biotic	*Temora* spp.		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
102	Biotic	*Oithona* spp.		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
103	Biotic	*Para-Pseudocalanus* spp.		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
104	Biotic	total traverse copepods		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
105	Biotic	*Calanus* fin		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
106	Biotic	*Calanus helo*		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
107	Biotic	*Calanus* (stages i-iv) spp.		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
108	Biotic	decapoda larvae		7aN	53N to 54.5N, 3W to 7W	Annual	monthly	1971-	Saphos	obs	CPR	https://www.sahfos.ac.uk/
109	Biotic	Cod spawning-stock biomass	tonnes	7aN		Annual		1968-	ICES WGCSE	m	Assessment	http://www.ices.dk/Pages/default.aspx
110	biotic	Cod recruitment	thousands	7aN		Annual		1968-	ICES WGCSE	m	Assessment	http://www.ices.dk/Pages/default.aspx
111	biotic	Herring spawning-stock biomass	tonnes	7aN		Annual		1961-	ICES HAWG	m	Assessment	http://www.ices.dk/Pages/default.aspx
112	biotic	Herring recruitment age 1	thousands	7aN		Annual		1961-	ICES HAWG	m	Assessment	http://www.ices.dk/Pages/default.aspx
113	biotic	Sprat biomass	tonnes	7aN		Annual	Aug	1998-	AFBI	obs	Survey	
114	biotic	Sprat weight at length	g	7aN		Annual	Aug	1998-	AFBI	obs	Survey	
115	Biotic	Plaice landings	tonnes	7aN		Annual		1964-	ICES WGCSE	m	Assessment	http://www.ices.dk/Pages/default.aspx
116	Biotic	Plaice recruitment		7aN				1993-	ICES WGCSE	m	Assessment	http://www.ices.dk/Pages/default.aspx
117	Biotic	*Nephrops* landings	tonnes	7aN	7aN-FU15	Annual		1965-	ICES WGCSE	m	Assessment	http://www.ices.dk/Pages/default.aspx
118	Biotic	Sole spawning-stock biomass	tonnes	7aN				1970-		m	Assessment	http://www.ices.dk/Pages/default.aspx
119	Biotic	Sole recruitment	thousands	7aN				1970-		M	Assessment	http://www.ices.dk/Pages/default.aspx
120	Biotic	Whiting landings	tonnes	7aN		Annual		1980-	ICES WGCSE	obs	ICES_catches	http://www.ices.dk/Pages/default.aspx
121	Pressures	Fishing effort	trawled hrs, Kw days	EU		Annual		2003-	STECF	obs		https://stecf.jrc.ec.europa.eu/data-reports
122	Pressures	Socio-Economic Indicators	various	EU		Annual		2008–2011	STECF	obs		https://stecf.jrc.ec.europa.eu/data-reports
123	Pressures	Surface and subsurface abrasion	area km^2	EU		Annual		2009–2013	OSPAR	obs		www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/DCF_indicators_567.pdf
124	Pressures	Land reclamation projects	No.	EU					OSPAR	obs		
125	Biotic	Substrate		EU					EU EMODNET seabed habitats	obs		www.emodnet-seabedhabitats.eu.
126	Pressures	Non indigenous species		EU					AquaNIS	obs		http://www.corpi.ku.lt/databases/index.php/aquanis
127	Abiotic	SST anomalies		Celtic Seas				1850-	HadSST2 dataset	obs		
128	Abiotic	SST anomalies		Celtic Seas				1986-	AVHRR satellite	obs		

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
129	Abiotic	SST anomalies		Celtic Seas				1958-	Malin Head	obs		
130	Abiotic	Salinity		Celtic Seas				1971-		obs	averaged over the region 48-58N, -15-3W	Nolan, 2009
131	Abiotic	Freshwater run-off		Celtic Seas				1999-		obs		Nolan and Lyons, 2006
132	Biotic	phytoplankton		Celtic Seas				1960-	CPR	obs		
133	Biotic	zooplankton						1958-	CPR	obs		
134	Abiotic	Water level	meters	Celtic Seas	Irish coast	Annual	< hourly	2007-	Irish National Tide Gauge Network Real Time Data	obs	Network of 14 tide gauges	http://data.marine.ie/
135	Abiotic	SST	°C	Celtic Seas	Irish coast	Annual	< hourly	2007-	Irish National Tide Gauge Network Real Time Data	obs	Network of 14 tide gauges	http://data.marine.ie/
136	Abiotic	Conductivity, Temperature, Depth - measures temperature, salinity, turbidity, and flourescence	various	Celtic Seas	Irish waters	Annual	various	1994-	Oceanographic CTD Stations	obs	SBE instrument samples to various depths	http://data.marine.ie/
137	Abiotic	Atmospheric Pressure (mbar), Air Temperature (°C), DewPoint Temperature (°C), Windspeed (knots), Max Gust Windspeed (knots), Wind Direction (degreeTrue), Sea Surface Temperature (°C), Wave Period (seconds), Wave Height (metres) and Relative Humidity (%).	various	Celtic Seas	Irish waters	Annual	< hourly	2001-	Weather Buoy Network Real Time Data	obs	Real-time meteorological and oceanographic data collected from the Irish moored Weather Buoy network of stations. Real time data available for M2, M3, M4, M5, and M6. Historical data available for M1, FS1 and original M4 spatial location. Advanced download allows a user define a bounding box area of interest selecting one or more buoys from the network. 'NaN' or '-999' describes missing or unavailable data.	http://data.marine.ie/
138	Abiotic	Temperature, Salinity	various	Celtic Seas	Irish waters	Annual	< hourly	2002-	weather buoy network temperature salinity	obs	Temperature and salinity measurements taken from the Weather Buoys. Temperature and salinity instrumentation associated with mooring.	http://www.isde.ie/#/df65fa7b-44a1-436b-a8fd-4dce787a8db2
139	Abiotic	Wave data: Peak Period (secs), Peak Direction (DegreesTrue), Upcross Period (secs) and Significant Wave Height (cm)	various	Celtic Seas	Irish waters	Annual	< hourly	2008-	wave buoy network	obs	Real-time data and services of ocean wave information from moored wave buoys. Real-time data available for Belmullet buoys and Galway Bay Wave Buoy. Historical data available for Galway Bay Wave Buoy 2. Users of the download service can choose a station, time period, parameter(s) and output file type. NaN or -999 describes missing or unavailable data.	http://www.isde.ie/#/55eb27e0-2fc3-4dab-9963-a99d12402a9e
140	Abiotic	Temperature, Salinity	various	Celtic Seas	Irish waters	Annual	< hourly	2003-	Celtic Voyager /Explorer Underway	obs	hull mounted sensor and temperature/salinity from the Thermosalinograph SBE21 SBE38 temperature sensor	http://www.isde.ie/#/1c3bec58-cb71-4307-b487-09b2bf92c774 http://www.isde.ie/#/f9fa995e-f2ad-49cc-805e-fd36b7cf010e
141	Abiotic	Temperature	°C	Celtic Seas	Irish waters	Annual	< hourly	1997–2003	RV Lough Beltra	obs	Collected via permanent scientific equipment	http://www.isde.ie/#/7486ca18-0ab4-46b6-9eb3-76846dd077fd

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
142	Abiotic	Temperature, Salinity	various	Celtic Seas	Irish waters	Annual	< hourly	1997–2003	Standard oceanographic research data collection. Windmill sea temperature data stream Celtic Voyager	obs	Sea surface temperature was collected via permanent scientific equipment on board the MI research vessel RV Celtic Voyager.	http://www.isde.ie/#/e4c6e4a5-8178-48e0-b27c-7c939ffa26fb
143	Abiotic	Depth	meters	Celtic Seas	Irish waters	Annual	< hourly	2003-	Estimate of bathymetry and water depth.	obs	RV Celtic Explorer and Celtic Voyager, depth sounder profile data via the Underway and SCS data systems on board each vessel.	http://www.isde.ie/#/6d9fe05c-3909-432d-bca3-d9ee56d8ff57
144	Abiotic	air temperature, atmospheric pressure, relative humidity, windspeed and wind direction.	various	Celtic Seas	Irish waters	Annual	< hourly	2003-	The BATOS II weather station	obs	RV Celtic Explorer and Celtic Voyager, collect meteorological data via the permanent scientific equipment BATOS weather station on board both vessels.	http://www.isde.ie/#/d0d2f3af-3411-4773-9778-f9f27ec0de03
145	Abiotic	Temperature, salinity and depth	Temperature, salinity and depth	Celtic Seas	Irish waters	Annual	< hourly	1999-	Marine Institute CTD	obs	Stations of the marine water column water column at various depths from the surface to within 10 m of the bottom of the water column.	http://www.isde.ie/#/b87734ce-33c0-4a26-a9a1-0567989f51b7
146	Abiotic	Temperature	°C	Celtic Seas	Irish Coast	Annual	hourly	2003-	TidbiT Probe Network Sea Temperature	obs	A network of internal logging temperature sensors at 17 locations around the Irish coast.	http://www.isde.ie/#/c455d22d-79c2-4dbb-95fb-917a33ea885c
147	Pressures	Fisheries activities research and analysis.	Total Allowable Catches (TACs), landings, fleet activity. Data available for download includes Shapefiles and ArcGIS compatible GeoTiff Images.	Celtic Seas	6 and 7	Annual		1987–2009 (various editions)	Atlas Commercial Fisheries around Ireland	obs	The atlas reviews the fishing activity on fish stocks of relevance to Ireland that come under the EU Common Fisheries Policy (CFP). The atlas focuses on fishing opportunities such as Total Allowable Catches (TACs), landings trends, fleet activity and the state of the resource in the waters around Ireland (principally ICES Subareas 6 and 7).	http://data.marine.ie/
148	Pressures	Atlas of Demersal Discarding	various	Celtic Seas	Irish waters	Annual		2012	Demersal discards scientific analysis.	obs	Demersal discards atlas provides information on discarding patterns by species and area by the various Irish demersal fleets.	http://data.marine.ie/
149	Pressures	Dredge Fishing Activity	various	Celtic Seas	Irish waters	Annual		1970–2013	Fishery definition for Natura 2000 habitat assessment.	obs	The dataset indicates the location of dredge fishing activity in Irish waters. This dataset was created in support of the Natura 2000 risk assessment in 2013. Please note that this dataset represents dredging activity for vessels < 15 metres length in Irish waters.	http://data.marine.ie/

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
150	Pressures	Inshore Fishing Atlas	various	Celtic Seas	Irish waters	Annual		2005–2006		obs	This Atlas was initiated as part of Ireland's preparation for the Water Framework Directive (WFD) which, inter alia, required mapping the distribution of mobile fishing gears in coastal waters (inside 1 n mile outside the baselines). The Atlas subsequently expanded the geographical extent of the review out to 12 nautical miles. The Atlas is a collection of 1885 polygons showing the distribution of fishing and fishery related activities.	http://data.marine.ie/
151	Pressures	inshore midwater trawl fishing activity (< 15 m)	various	Celtic Seas	Irish waters	Annual		2013	Fishery definition for Natura 2000 habitat assessment.	obs	Data indicates the location for midwater trawl fishing activity in Irish waters. These data were created in support of the Natura 2000 risk assessment in 2013. Please note that this dataset represents midwater trawl activity for vessels < 15 metres length in Irish waters.	http://www.isde.ie/#/c2a1ceb4-fa6e-4119-9d99-01de3fdc7279
152	Pressures	Inshore Bottom trawl Fishing Activity (< 15 m)	various	Celtic Seas	Irish waters	Annual		2011–2013	Fishery definition for Natura 2000 habitat assessment.	obs	The dataset indicates the location for bottom trawl fishing activity in Irish waters. This dataset was created in support of the Natura 2000 risk assessment in 2013. Please note that this dataset represents bottom trawl activity for vessels < 15 metres length in Irish waters.	http://www.isde.ie/#/1f7d5941-9b2d-42c7-9618-edb734d9d11e
153	Pressures	Inshore Pot Fishing Activity (< 15 m)	various	Celtic Seas	Irish waters	Annual		2010–2013	Fishery definition for Natura 2000 habitat assessment.	obs	Data indicates the location for pot fishing activity in Irish waters. This dataset was created in support of the Natura 2000 risk assessment in 2013. Please note that this dataset represents potting activity of vessels < 15 metres length in Irish waters. The dataset does not provide high resolution location information. The data offers the approximate location of known fishing grounds for the specified gear type using expert knowledge, survey data, and questionnaire data gathered by the Marine Institute.	http://www.isde.ie/#/62745397-9998-41d8-b2f7-ec91d22122f1
154	Pressures	Inshore line fishing activity (< 15 m)	various	Celtic Seas	Irish waters	Annual		2010–2013	Fishery definition for Natura 2000 habitat assessment.	obs	Data indicates the location for line fishing activity in Irish waters. This dataset was created in support of the Natura 2000 risk assessment in 2013. Please note that this dataset represents line fishing activity of vessels < 15 metres length in Irish waters.	http://www.isde.ie/#/b9494f69-72f8-40f0-84d2-ab7ae9d1fd5e
155	Pressures	Inshore net fishing activity (< 15 m)	various	Celtic Seas	Irish waters	Annual		2010–2014	Fishery definition for Natura 2000 habitat assessment.	obs	The data indicates the location of net fishing activity in Irish waters. This dataset was created in support of the Natura 2000 risk assessment in 2013. Please note that this dataset represents net fishing acitivty of vessels < 15 metres length in Irish waters.	http://www.isde.ie/#/664ede40-a265-4140-89ab-5246cb6db8fe

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
156	Pressures	Commercial Fishing Intensity by Fishing Gear and Fishing Time	VMS data	Celtic Seas	Irish waters	Annual		2012	Fishing intensity mapping used in Ireland's Marine Atlas for MSFD monitoring and reporting.	obs	Vessel Monitoring Systems (VMS) automatically collect positional data from fishing vessels. The VMS data can be linked to catch data from logbooks to provide a census of spatially resolved catch and effort data. Fishing method data includes all gears, mobile bottom, mobile other, mobile seine and passive.	http://www.isde.ie/#/d869acb0-0f81-4711-984c-c25342d8b095
157	biotic	Fish Species population and abundance.	various	Celtic Seas	Irish waters	Annual		2004–2009	The Biological Sampling Survey	obs	survey	http://www.marine.ie/Home/site-area/data-services/interactive-maps/biological-sampling-surveys
158	biotic	Fish Species population and abundance.	abundance	Celtic Seas	6a, 7b,g,j	Q4	annual	2003–2009	Irish Groundfish Survey	obs	Two gear survey since 2004, using GOV groundgear "A" for Areas 7b,g and j and "D"for Area 6a.	http://www.isde.ie/#/fb44544f-1398-4e57-8d20-fb7801a538f4
159	Biotic	*Nephrops* biomass	various	Celtic Seas	Irish waters			2002-	*Nephrops* Underwater Television Survey Stations	obs	The prawn (*Nephrops norvegicus*) are common around the Irish coast occurring in geographically distinct sandy/muddy areas were the sediment is suitable for them to construct their burrows. This dataset for UWTV Survey stations in the areas known as the Aran Grounds, the Irish Sea and the Celtic Sea which are surveyed on three separate surveys. Parameters measured: - Spatial Location - Survey - Count of Burrows - Station - Density Quality information associated with the dataset available in the full metadata lineage.	http://www.isde.ie/#/9410664b-6bf1-42aa-896f-1934ab1779e4
160	biotic	Shellfish Stocks and Fisheries Review	various	Celtic Seas				2009–2011	Shellfish distribution.	obs	This review presents information on the status of selected shellfish stocks in Ireland. In addition data on the fleet (< 13 m) and landings for all species of shellfish (excluding *Nephrops*) are presented. The intention of the annual reviews is to present stock assessment and scientific advice for shellfisheries which may be subject to new management proposals or where scientific advice is required in relation to assessing the environmental impact of shellfisheries especially in conservation areas designated under European Directives.	http://data.marine.ie/
161	Abiotic	Essential habitat	Eunis classifications	Celtic Seas				2001-2005	SCALLOP HABITAT	obs	Multibeam echosounder data and seabed sampling data acquired during the INFOMAR national seabed mapping programme were the primary sources of data used in the generation of this habitat map for the Inshore Fisheries section of Bord Iascaigh Mhara. The original sediment classes assigned to the data were translated to the EUNIS habitat classification system as part of the MESH Atlantic project.	http://www.isde.ie/#/9b42028b-4b4f-44c0-bcbd-2e588e124ca1

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
162	Abiotic	Species Spawning and Nursery Areas	Polygon boundaries of nursery and spawning areas for commercial species compared to the Biologically Sensitive Area designation.	Celtic Seas				2009	Species nursery and spawning ground definition.	obs	The spawning and nursery grounds of commercially important species in the area of the Irish Box. Assess whether the spawning and nursery grounds so described coincide with the boundaries of the Irish Box, and if not, which criteria could be used for a new definition of such boundaries, and which would then be the description of such boundaries; Assess the Irish Box effort constraint in the context of other conservation measures adopted in the area, in particular the gear restriction in Regulation 494/2002. In particular, evaluate the relative importance of these measures, whether any results in terms of resource conservation can be attributed to them, their coherence in terms of boundaries and content, and whether they depend in their effectiveness one on another.	http://www.isde.ie/#/67bbe093-b8c7-4d17-9f5a-4421b2fb14f8
163	biotic	fish eggs and larvae		Celtic Seas			tri-annual	2007- (survey running since 1977?)	Mackerel Egg Survey	obs	GULF sampler profile to within 5m of the bottom, or a max depth of 200 m, whichever is greater. Water temperature at 5 m, 20 m, 50 m, 100 m and max sample depth where appropriate, salinity at 20 m, volume of water filtered during the tow, and Stage 1 egg counts for mackerel and horse mackerel.	http://www.isde.ie/#/0858f89b-5d14-474b-a6cb-dc720a683165
164	biotic	Pelagic fish biomass	tonnes	Celtic Seas		various	Annual	1999-	Acoustic surveys (herring, blue whiting, boar fish)	obs	Northwest Herring Acoustic Survey (July), Celtic Sea herring Acoautic Survey (Q4), International Blue Whiting Acoustic Survey (spring), Boarfish (july)	http://www.isde.ie/#/63c49686-11f6-48ce-9ea0-de9fb19bb1d8

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
165	Abiotic	Habitat map	Eunis classifications	Celtic Seas				1999–2014	Base layer to predict seabed habitats.	obs	Multibeam echosounder data and seabed sampling data acquired during the INFOMAR and INSS national seabed mapping programmes are the primary sources of data used in the generation of this seabed substrata layer. This map of ground type, together with data collated from other habitat mapping projects and seabed surveys, were integrated in a GIS to produce a single, harmonized layer of substrate distribution within the Currently Designated Irish continental shelf boundary. The original classes assigned to the data were translated to a modified Folk class to facilitate a seamless reclassification of the data to the EUNIS classification system. Information on biological zones from the MeshAtlantic project were used to translate the data to EUNIS. All collation work was carried out as part of the MeshAtlantic project, the objective of which is to produce a single, broadscale, habitat map of the Irish Currently Designated continental shelf Area.	http://data.marine.ie/
166	Biotic	Benthos monitoring in the marine environment		Celtic Seas				2002-	Sediment monitoring, habitat classification and Water Framework Directive monitoring programme.	obs	Surveys using a variety of tools have been used to assess natural conditions prior to development or to assess the conservation status of an area. The Marine Environment and Food Safety Services Benthic Monitoring Unit is responsible for the review and assessment of existing and proposed activities that may have an influence on the marine environment.	http://www.isde.ie/#/8bcb5cde-1493-4723-8d54-564a68d80442
167	Abiotic	Celtic Sea Offshore Habitats	Eunis classifications	Celtic Seas				1999–2011	Base layer to verify predicted seabed habitats.	obs	Data on marine habitats for the Celtic Sea generated from the collation of historical habitat data by Aquafact Environmental Consultants as part of the Strategic Environmental Assessment of the Irish and Celtic Seas, and published in the IOSEA 4 Report. The original classes assigned to the data were translated to the EUNIS habitat classification system as part of the MESH Atlantic project.	http://www.isde.ie/#/7df77d4e-89a2-4f73-8ff3-1da2a0cfd556
168	Abiotic	Celtic Sea Nearshore Habitats	Eunis classifications	Celtic Seas				1999–2011	Base layer to predict seabed habitats.	obs	Multibeam echosounder data and seabed sampling data acquired during the INFOMAR national seabed mapping programme were the primary sources of data used in the generation of this marine habitat map. The original classes assigned to the data were translated to the EUNIS habitat classification system as part of the MESH Atlantic project.	http://www.isde.ie/#/da029dbc-a4de-45c7-9666-ae7e35d93af4

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
169	Abiotic	Irish Sea Pilot Project Eunis Habitats	Eunis classifications	Celtic Seas				2009	Base layer to verify predicted seabed habitats.	obs	Data on marine habitats for the Irish Sea generated from the collation of historical sediment and biological data by Joint Nature Conservation Committee as part of the Irish Sea Pilot Project. The original classes assigned to the data were translated to the EUNIS habitat classification system as part of the MESH Atlantic project.	http://www.isde.ie/#/0a779687-42f6-424a-91cc-a4cf2733f938
170	Abiotic	South Irish Sea Habitats	Eunis classifications	Celtic Seas				2009	Base layer to predict seabed habitats.	obs	Multibeam echosounder data and seabed sampling data acquired during the INFOMAR national seabed mapping programme were the primary sources of data used in the generation of this marine habitat map. The original classes assigned to the data were translated to the EUNIS habitat classification system as part of the MESH Atlantic project.	http://www.isde.ie/#/086a34bf-6863-43da-84c3-a9629cca73de
171	Abiotic	Southwest Ireland Seabed Habitats	(Low level) Eunis classifications	Celtic Seas				2001–2005	Low level EUNIS habitat map to delineate rock and soft sediment habitats.	obs	Multibeam echosounder data and seabed sampling data acquired during the INSS and INFOMAR national seabed mapping programmes were the primary sources of data used in the generation of this habitat map. The original sediment classes assigned to the data were translated to the EUNIS habitat classification system as part of the MESH Atlantic project.	http://www.isde.ie/#/14821af9-9ea7-4faf-ac45-4efe3b0d13a7
172	Abiotic	IMAGIN Project Irish Sea Habitats	Eunis classifications	Celtic Seas				2009	Map to display the extent of coarse sediment at 4 potential aggregate removal sites in the Irish Sea.	obs	This classification was produced using approach similar to the used by BGS in creation of seabed sediments maps. The interpretation used data from surface grab samples and surface subsamples from vibro core samples, incorporated within GIS and interpreted together with multibeam backscatter and shaded relief. The original classes assigned to the data were translated to the EUNIS habitat classification system as part of the MESH Atlantic project.	http://www.isde.ie/#/08aed200-5da4-4726-b22b-9a362f5e467f

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
173	Abiotic	Predominant Habitat Confidence	Predominant habitat confidence	Celtic Seas				2009	Predominant marine habitat mapping for MSFD monitoring and reporting included in Ireland's Marine Atlas.	obs	The MSFD commission staff working paper (CSWP) defines predominant habitat types required for use in MSFD habitats initial reporting article 8 - "Analysis of essential features and characteristics (Art 8.1a - Habitats)". These predominant habitat typologies broadly correspond to EUNIS level 2 habitat typologies. This supported the process of mapping existing habitat types (evidence based and predicted) to the CSWP PHT classification by means of data re-engineering. In areas where neither evidence nor predicted data were available, a depth proxy was created using INFOMAR bathymetry. When viewing the PHT habitats layer, the Predominant Habitat Confidence should be also be used as reference as this provides the user with a means to establish the data source underpinning the derived PHT habitat type per polygon.	http://www.isde.ie/#/987c8b25-6939-455a-a2bd-dc7af0559780
174	Abiotic	Predominant Habitat Type	Eunis classifications	Celtic Seas				2012-	Marine Strategy Framework Directive Initial Reporting - Art 8.1a - Habitats	obs	The MSFD commission staff working paper (CSWP) defines predominant habitat types required for use in MSFD habitats initial reporting article 8 - "Analysis of essential features and characteristics (Art 8.1a - Habitats)". These predominant habitat typologies broadly correspond to EUNIS level 2 habitat typologies. This supported the process of mapping existing habitat types (evidence based and predicted) to the CSWP PHT classification by means of data re-engineering. In areas where neither evidence nor predicted data were available, a depth proxy was created using INFOMAR bathymetry. When viewing the PHT habitats layer, the Predominant Habitat Confidence should be also be used as reference as this provides the user with a means to establish the data source underpinning the derived PHT habitat type per polygon.	http://www.isde.ie/#/fdb5bb9e-6bce-420c-a11f-1274ef815be5

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
175	Abiotic	Contaminants in sediments		Celtic Seas			annual	1990-	Sediment chemistry monitoring for Water Framework Directive, OSPAR, Marine Strategy Framework Directive, national monitoring and research projects.	obs	Baseline, geographical and temporal trend monitoring of contaminants and parameters in sediments around Irish waters.	http://www.isde.ie/#/faaf6b02-ab70-482b-a5dc-779386d07d02
176	Abiotic	Contaminants in water		Celtic Seas			irregular	1990-	Water chemistry monitoring for Water Framework Directive, Shellfish Waters Directive, OSPAR, Marine Strategy Framework Directive, national monitoring and research projects.	obs	Baseline, geographical and temporal trend monitoring of contaminants and parameters in water.	http://www.isde.ie/#/29ce0c45-f5a1-448f-b18c-ce1bf0a00a5b
177	Abiotic	Contaminants in biota		Celtic Seas			quarterly	1992-	Biota chemistry monitoring for Water Framework Directive, Shellfish Waters Directive, OSPAR, Marine Strategy Framework Directive, food safety, national monitoring and research projects.	obs	Baseline, geographical and temporal trend monitoring of heavy metals and chlorinated hydrocarbons in biota from Irish estuarine and coastal waters. This environmental dataset includes the sample locations monitored.	http://www.isde.ie/#/d555b645-8f84-4c3d-95c5-bb26d9b21e51
178	Biotic	Harmful Algae Blooms		Celtic Seas	Irish waters		monthly	2002-	HABs Offshore Shellfish Monitoring	obs	ICES statistical rectangles are used for reporting offshore shellfish where King Scallop shellfish samples are derived and analysed for chemistry and bioassay properties from fishing ports. Note HABs Disclaimer applies to the provision of these data.	http://www.isde.ie/#/16059058-0642-451e-aee9-48658777ec2c
179	Biotic	Harmful Algae Blooms		Celtic Seas	Irish waters		monthly	2002-	Habs inshore shellfish biotoxins monitoring	obs	Harmful Algal Bloom (HABS) inshore shellfish sample survey monitoring results since 2002. Quality data is available with the full metadata lineage. Note HABs Disclaimer applies to the provision of these data.	http://www.isde.ie/#/0aaa792a-f21a-432b-80b4-541e95e3f9a9

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
180	Biotic	Phytoplankton Species, Phytoplankton Count, Phytoplankton Biomass and Report Name	various	Celtic Seas	Irish waters	All		2002-	Habs inshore phytoplankton monitoring	obs	Phytoplankton sample stations are regularly sampled around the Irish coastline as part of the HABs monitoring programme since 2002. The sample sites coincide with finfish aquaculture sites. For details on the quality control process view full metadata lineage. Note HABs Disclaimer applies to the provision of these data.	http://www.isde.ie/#/189c7356-385e-405f-b5e4-50ee49b6e90f
181	Biotic	Fish lice	abundance	Celtic Seas				1991-	National Survey Finfish FarmS	obs	A sea lice monitoring programme for finfish farms in Ireland. Results presented indicate the mean ovigerous sea lice levels and mean mobile sea lice levels for *Lepeophtheirus salmonis* and *Caligus elongatus*.	http://www.isde.ie/#/3eed78d3-65ff-405a-9f45-98d3d90b32ee
182	Pressures	Fisheries Biologically Sensitive Area	Polygon dataset of fisheries protected site.	Celtic Seas				2003	Biological protection zone designation for fisheries effort.	obs	In 2003 the EU Commission established a "Biologically Sensitive Area (BSA)" off the southwest of Ireland and the area is shown on the map associated with the dataset. (Council Regulation (EC) No 1954/2003).	http://www.isde.ie/#/8d43a523-ac83-4e48-b951-d27b268911b2
183	Biotic	National Coded Wire Tagging and Tag Recovery Programme	Location ,Number of fish, Tag code, Weight, Tag retention, etc.	Celtic Seas				1980-	Annual Assessment of Exploitation and Marine Survival from Experimental Releases of CWT Salmon	obs	Up to 300 000 smolts (from various Irish hatcheries, including Burrishoole and wild fish from the Corrib river) are tagged annually and the data in relation to this tagging process is on file since 1980. Wild salmon are released woth tags on the Corrib. Ad hoc tagging takes place on the Foyle, Liffey and Boyne. The monitoring information (tagging and release information and information on individual fish recaptured in fisheries or broodstocks) is maintained in a relational database on the Burrishoole server. Since the programme began in 1980, over 6 million salmon smolts have been tagged and released generating approximately half a million tag recoveries and information on individual salmon returns.	http://www.isde.ie/#/44736cd4-4e67-4fc0-a80a-d6f1031acd9c
184	Abiotic	Significant Wave Height (m), Mean Wave Direction (degreesTrue) and Mean Wave Period (seconds)	various		Resolution of 0.025 degrees.			2010-	East Atlantic SWAN Wave Model	M	Resolution of 0.025 degrees.	http://data.marine.ie/
185	Abiotic	Sea surface temperature (degreeCelsius), Sea bottom temperature (degreeCelsius), Surface salinity (PSU), Bottom salinity (PSU), Surface velocity (m/sec), Mixed layer depth, Significant wave height (m), Mean wave direction (degreeTrue) and Mean wave period (sec)	various				monthly	2010-	Monthly SWAN and ROM Model Means	M	Monthly mean values for oceanographic parameters in Irish waters from the Marine Institute SWAN and ROMS models.	http://data.marine.ie/

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
186	Abiotic	bottom currents, Bottom salinity, Bottom Temperature, Surface Temperature, Surface Current, Surface Salinity, Heat Flux	various	NE Atlantic	2.5 km, 40 levels	Annual	daily	2007-	ROMS (Regional Ocean Modeling System)	M	The hydrodynamic model, ROMS (Regional Ocean Modeling System), is run for a domain that covers a significant portion of the Northeast Atlantic at a resolution of 2.5 km and and with 40 vertical levels. 7-day forecasts are generated for research purposes and for comparison with measured data. The Marine Institute does not guarantee to make model output available on its website.	http://www.isde.ie/#/a53cb1c3-a48f-4166-bb7a-6b7d87173856
187	Biotic	Elasmobranch	prescenc e					2009- 2007-?	Distribution Nursery areas, numbers of offspring, distribution NOTE: Pelagics are sometimes caught in deep water and pelagic surveys, but are not the focus and so data are lacking	obs	Sightings, surveys, tagging (satelliite and visual), photo ID Sightings of mermaids purses	www.baskingshark.ie Marine Dimensions (2015)
188	Biotic	Deep-sea benthos and fish	abunda nce and biomass					2007-2009 1993-1999	Irish deep water surveys - species abundance, distribution, lengths. Commerical species also have further biological sampling (e.g. weight, sex, maturity, age). Primarily species ID and abundance, some length, weight, sex, maturity, age and some stomach and gonad samples taken. Plankton and CTD data collected for some surveys. Whole fish returned for contaminant analyses, some muscle for stable isotope analyses.	obs	2 hour depth stratified tows (500 m, 1000 m, 1500 m and 1800 m) 4 hour depth stratified tows (500–700m, 700–900 m, 900–1100 m, and 1100–1300m) Longlines (1997)	O'Hea *et al*. (2009), Johnston *et al*. (2012) Clarke *et al*. (1999), Connolly *et al*. (1999), Clarke and Moore (2002)

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
189	Biotic	Reptiles	abundance					not consistent - ad hoc sightings	Location, species, condition (alive/stranded)	obs		http://maps.biodiversityireland.ie/
190	Biotic	Seabirds	abundance					Y - stem back to 1968, but sporadic in most cases)	JNCC Seabird Monitoring Programme. Seabirds at sea and colony monitoring: Species, abundance, distribution and breeding success (selected spp).	obs	*Ad-hoc* visual surveys and ships of opportunity (incl. Cetaceans on the Frontier 2008–2014, Irish Deep water Survey 2006–2008, Blue whiting 2004-)	Mackey and Gimenez, (2004) Crowe (2012) Tasker (2000)

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
191	Biotic	Seals	abundance	Irish and Celtic Seas				2009 - (harbour), - site series), 2011- (grey - site series) . 2014- 1996–1998 2012–2014 2011–2012 1978–2003	Species, abundance, population size, distribution, pup production and haul out sites monitored (data stored at NBDC). Bycatch recently added (2014) Grey seals in Irish and Celtic seas: abundance, seasonal distribution and haul out sites, stomach contents (taken as bycatch seals) Dead seal database Harbour Seal Census (haul outs); also notes grey seal encounters Summary of Seal Surveys 1978–2003	obs	Land, boat and aerial counts. Fishery bycatch observers. Observation, photographic mark and recapture, stomach contents Stranding reports (condition, location) Aerial Surveys and thermal imaging	

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
192	Biotic	Toothed Whales	abundance					2010 - to 1999- 1994,2005, 2007, 1999-2001	Bycatch IWDG and MI: Species, abundance, range, distribution, habitat. Visual surveys 2001-to , deep water surveys 2006-2008, ad hoc 1999-to Irregular ship based surveys e.g. SCANS, CODA, Cetaceans and Seabirds at Sea	obs	Bycatch monitoring, MMO and IWDG visual surveys/ships of opportunity (e.g. Celtic herring survey), ferry and Land-based watches Visual transect surveys	Boyd *et al.* (2012) , Cosgrove (2014) Wall (2013), Berrow *et al.* (2013) NPWS (2009)
193	Biotic	Baleen Whales	abundance					2010 - to 1999- 1994,2005, 2007, 1999-2001	Bycatch IWDG and MI: Species, abundance, range, distribution, habitat. Visual surveys 2001-to , deep water surveys 2006-2008, *ad hoc* 1999-to Irregular ship based surveys e.g. SCANS, CODA, Cetaceans and Seabirds at Sea	obs	Bycatch monitoring, MMO and IWDG visual surveys/ships of opportunity (e.g. Celtic herring survey), ferry and Land-based watches Visual transect surveys	Boyd *et al.* (2012) , Cosgrove (2014) Wall (2013), Berrow *et al.* (2013) NPWS (2009)
194	Abiotic	Temp, Bottom Temp, Salinity, Currents (no wave)		Northwest Shelf Seas	7 km, 24 levels		Monthly, Daily	1985–2012	Atlantic-European Northwest Shelf- Ocean Physics Reanalysis From Metoffice (1985-2012)	Model	Physical	http://marine.copernicus.eu/web/69-interactive-catalogue.php?

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
195	Abiotic	Temp, Salinity, Ocean Currents (not waves), sea surface height (above geoid), and bottom temp, salinity and currents	Northwest Shelf Seas	7km, 24 levels		Daily, Hourly	2011-	Atlantic - European Northwest Shelf - Ocean Physics Analysis And ForecasT	Model	Physical	http://marine.copernicus.eu/web/69-interactive-catalogue.php?	
196	Abiotic/ Biotic	Chlorophyll-*a*, Dissolved O_2, Nitrate, Phosphate, Phytoplankton, Primary Production, Radiative Flux	Northwest Shelf Seas	7 km, 24 levels		Monthly, Daily	1985–2012, 2012-	Ocean Biogeochemistry Reanalysis From Metoffice	Model	Biochem	http://marine.copernicus.eu/web/69-interactive-catalogue.php?	
197	Abiotic	Temp, Salinity, Ocean Currents (not waves), sea surface height (above geoid)		Iberia, Biscay, Ireland	2.5 km, 50 levels		Daily, Hourly	2013-	Ocean Physics Analysis And Forecast	Model	Physical	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
198	Abiotic	Temp, Salinity, Ocean Currents (not waves), sea surface height (above geoid)		Northwest Shelf Seas	12 km, 24 levels		Monthly	1960–2004	Nercpol	Model	Physical	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
199	Abiotic	Temp, Salinity, Ocean Currents (not waves), sea surface height (above geoid)		Northwest Shelf Seas	12 km, 24 levels		Monthly	1985–2008	Ocean Physics Non Assimilative Hindcast From IMR	Model	Physical	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
200	Abiotic	Temp, Salinity, Ocean Currents (not waves), sea surface height (above geoid)		Northwest Shelf Seas	8 km, 26 levels		Monthly	1993–2009	Ocean Physics Reanalysis From IMR (1993–2009)	Model	Physical	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
201	Abiotic/ Biotic	Chlorophyll-*a*, Dissolved O_2, Nitrate, Phosphate, Phytoplankton, Primary Production, Radiative Flux	Northwest Shelf Seas	12 km, 24 levels		Monthly	1967–2004	Ocean Biogeochemistry Non Assimilative Hindcast From Nercpol	Model	Biochem	http://marine.copernicus.eu/web/69-interactive-catalogue.php?	
202	Abiotic/ Biotic	Dissolved O_2, Nitrate, Phosphate, Phytoplankton, Primary Production, Silicate		Northwest Shelf Seas	12 km, 24 levels		Monthly	1985–2004	Ocean Biogeochemistry Non Assimilative Hindcast From IMR	Model	Biochem	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
203	Abiotic/ Biotic	Dissolved O_2, Nitrate, Phosphate, Phytoplankton, Primary Production, Silicate		Northwest Shelf Seas	8 km, 26 levels		Monthly	1993–2009	ocean biogeochemistry non assimilative hindcast from IMR	Model	Biochem	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
204	Abiotic	Temp, Salinity, Ocean Currents (not waves), sea surface height (above geoid)		Iberia, Biscay, Ireland	7.5 km, 50 levels		Monthly, Daily, Hourly	2002-2011	Atlantic-iberian biscay irish- ocean physics reanalysis (2002–2011)	Model	Physical	http://marine.copernicus.eu/web/69-interactive-catalogue.php?

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
205	Abiotic/ Biotic	Chlorophyll *a*, Dissolved O_2, Nitrate, Phosphate, Phytoplankton, Primary Production, Silicate, Iron, Ammonium, Depth of Euphotic Zone	Atlantic, Iberia, Biscay, Irish	7.5 km, 50 levels		Monthly	2002-2011	Atlantic-Iberian Biscay Irish-Ocean biogeochemistry non assimilative hindcast (2002-2011)	Model	Biochem	http://marine.copernicus.eu/web/69-interactive-catalogue.php?	
206	Biotic	Chlorophyll *a*		North Atlantic	1 km, 1 level (Surface)		Daily	2013-	Surface chlorophyll concentration from satellite observations	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
207	Biotic	Chlorophyll *a*		North Atlantic	1 km, 1 level (Surface)		Daily	1997-2012	North altantic chlorophyll concentration from satellite observations (daily average) reprocessed l3 (esa-cci) (1997–2012)	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
208	Biotic	Chlorophyll *a*		North Atlantic	1 km, 1 level (Surface)		Daily	2014-	North Atlantic Chlorophyll (Optimal Interpolation)	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
209	Abiotic	Optical Water Properties		North Atlantic	1 km, 1 level (Surface)		Daily	2013-	North Atlantic Remote Sensing Reflectances, Attenuation Coefficient At 490 nm, And Inherent Optical Properties From Satellite Observations	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
210	Abiotic	Optical Water Properties		North Atlantic	1 km, 1 level (Surface)		Daily	1997-	North Atlantic Ocean, Ocean Optics Products (Daily Average) Reprocessed L3 (Esa-Cci) (1997-2012)	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
211	Biotic	Chlorophyll *a*		NWS and IBI	1 km, 1 level (Surface)		Daily	2015-	European Sea Surface Chlorophyll Concentration From Multi Satellite Observations	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
212	Abiotic	Sea level anomaly		NWS and IBI	7 km, 1 level (Surface)		Daily	2015-	European Ocean Along-Track Sea Level Anomalies Nrt	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
213	Abiotic	Sea surface temperature (SST)		NWS and IBI	2 km, 1 level (Surface)		Daily	2010-	European Ocean- Sea Surface Temperature Mono-Sensor L3 Observations	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
214	Abiotic	Sea surface temperature (SST)		NWS and IBI	2 km, 1 level (Surface)		Daily	2012-	European Ocean- Sea Surface Temperature Multi-Sensor L3 Observations	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
215	Abiotic	Sea surface temperature (SST)		NWS and IBI	2 km, 1 level (Surface)		Daily	2007-	Atlantic European Northwest Shelf Ocean - Odyssea Sea Surface Temperature Analysis	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
216	Abiotic	Sea surface temperature (SST), Sea-Ice Concentration		NWS and IBI	2 km, 1 level (Surface)		3 Hourly	2014-	European Ocean- Sea Surface Temperature Multi Sensor L4 Three-Hourly Observations	obs	Satellite	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
217		Temperature, Salinity, Currents, Sea Surface Height, Chlorophyll *a*		NWS and IBI	discrete platforms		Daily	2010-	Atlantic-European Northwest Shelf- Ocean In-Situ Near Real Time Observations	obs	In Situ	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
218	Abiotic/ Biotic	Temperature, Salinity, Currents, Sea-Surface Height, Chlorophyll *a*		NWS and IBI	discrete platforms		Daily	2010-	Atlantic Iberian Biscay Irish Ocean- In-Situ Near Real-time Observations	obs	*In Situ*	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
219	Abiotic	Temperature, Salinity		NWS and IBI	discrete platforms		Daily	1990–2013	Atlantic-European Northwest Shelf- In-Situ Observations Yearly Delivery In Delayed Mode (1990-2013)	obs	*In Situ*	http://marine.copernicus.eu/web/69-interactive-catalogue.php?
220	Abiotic	Temperature, Salinity		NWS and IBI	discrete platforms		Daily	1990–2013	Atlantic Iberian Biscay- In-Situ Observations Yearly Delivery In Delayed Mode (1990-2013)	obs	*In Situ*	http://marine.copernicus.eu/web/69-interactive-catalogue.php?

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
221	Abiotic	eastward_sea_water_velocity, northward_sea_water_velocity, sea_surface_height_above_geoid, sea_water_salinity, sea_water_temperature	NWS Seas	0.11 degree	Annual	Daily mean, Hourly instantaneous	2011-	Forecasting Ocean Assimilation Model 7 km Atlantic Margin model (FOAM AMM7)	Model	a coupled hydrodynamic-ecosystem model, nested in a series of one-way nests to the Met Office global ocean model. The hydrodynamics are supplied by the Nucleus for European Modelling of the Ocean (NEMO) with the 3DVar NEMOVAR system used for the assimilation of sea surface temperature data. This is coupled to the European Regional Seas Ecosystem Model (ERSEM), developed at Plymouth Marine Laboratory (PML).	http://marine.copernicus.eu/web/69-interactive-catalogue.php?	
222	Abiotic	Temperature	°C	9a	GoC		Quarterly	2009-present	Surveys	O	CTD	IEO, ICMAN-CSIC
223	Abiotic	Temperature	°C	9a	GoC		Continuous	2008-2011	Estuarine moorings	O	Temperature sensors	ICMAN-CSIC
224	Abiotic	Temperature	°C	9a	GoC		Continuous	2000-2010	Coastal moorings	O	Temperature sensor, chain of termistors	ICMAN-CSIC
225	Abiotic	Temperature	°C	9a	GoC		Continuous	199X-present	Offshore moorings	O	Temperature sensor	Puertos del Estado
226	Abiotic	Temperature	°C	9a	GoC		Daily	1985-onwards	Satellite	O	AVHRR	ICMAN-CSIC
227	Abiotic	Temperature	°C	9a	GoC		Continuous	1998-2008	ROMS	M	Numerical	ICMAN-CSIC /University Lisbon
228	Abiotic	Salinity		9a	GoC		Quarterly, monthly, single	2000-present	Surveys STOCA (Regional Series, National Research Program, GOLFO, P3A2)	O	CTD	IEO, ICMAN-CSIC
229	Abiotic	Salinity		9a	GoC		Continuous	2008–2011	Estuarine moorings	O	Salinity sensor	ICMAN-CSIC

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
230	Abiotic	Salinity		9a	GoC		Continuous	199X-present	Offshore moorings	O	Salinity sensor	Puertos del Estado
231	Abiotic	Salinity		9a	GoC		Continuous	1998–2008	ROMS	M	Numerical	ICMAN-CSIC /University Lisbon
232	Abiotic	Oxygen		9a	GoC		Quarterly, monthly, single	2000-present	Surveys	O	Winkler (CTD)	IEO, ICMAN-CSIC
233	Abiotic	Oxygen		9a	GoC		Continuous	2008–2011	Estuarine moorings	O	Oxigen sensor	ICMAN-CSIC
234	Abiotic	Hydrodynamics (currents)	m/s	9a	GoC		Quarterly, monthly, single	2000-present	Surveys	O	ADCP	IEO, ICMAN-CSIC
235	Abiotic	Hydrodynamics (currents)	m/s	9a	GoC		Continuous	2008–2011	Estuarine moorings	O	ADCP	ICMAN-CSIC
236	Abiotic	Hydrodynamics (currents)	m/s	9a	GoC		Continuous	2000–2010	Coastal moorings	O	ADCP	ICMAN-CSIC
237	Abiotic	Hydrodynamics (currents)	m/s	9a	GoC		Continuous	199X-present	Offshore moorings	O	ADCP	Puertos del Estado
238	Abiotic	Hydrodynamics (currents)	m/s	9a	GoC		Continuous	1998–2008	ROMS	M	Numerical	ICMAN-CSIC /University Lisbon
239	Abiotic	Turbidity	NTU	9a	GoC		Continuous	2012-present	STOCA	O	Turbidimeter	IEO
240	Abiotic	Turbidity	NTU	9a	GoC		Continuous	2008–2011	Estuarine moorings	O	Turbidimeter	ICMAN-CSIC
241	Abiotic	River discharges	m^3/s	9a	GoC		Daily	1941-present	CHG (Confederacion Hidrografica Guadalquivir)	O	Gauge station	
242	Abiotic	Nutrients		9a	GoC		Quarterly, monthly, single	2000-present	Surveys	O	Chemical methods	IEO,ICMAN-CSIC
243	Abiotic	Nutrients		9a	GoC		Monthly	198X-onwards	Estuarine station	O	Chemical methods	CHG
244	Abiotic	Extensive chemical composition of the water		9a	GoC		Monthly	198X-onwards	Estuarine station	O	Chemical methods	CHG
245	Abiotic	Bathymetry		9a	GoC		Continuous	2011/2012	Ecocartografía	O	multibeam	Magrama (MInistry of Agriculture, Food and Environment)
246	Abiotic	Bathymetry		9a	GoC		Single-Single	10/2011–04/2012	Indemares Chic	O	multibeam	IEO
247	Abiotic	Bathymetry		9a	GoC		Single	2010	ContourIber	O	multibeam	U. Vigo
248	Abiotic	Bathymetry		9a	GoC		Several	Several	EMODNET compilation	O		www.emodnet-hydrography.eu/
249	Abiotic	Bathymetry		9a	GoC			2000–2005	SWIM compilation	O		
250	Abiotic	Bathymetry		9a	GoC		Unknown	Unknown	Ad-hoc cruises	O	Sonar	IHM (Instituto Hidrografico de la Marina)
251	Abiotic	Coastal Morphology		9a	GoC		Unknown	195X-onwards	Aereal pictures	O	Photograph	CMA (Consejeria Medio Ambiente)
252	Biotic	Detritus/ Bacterials		9a	GoC		Monthly, single	2000–2008	Surveys	O	Analytical methods	ICMAN-CSIC
253	Biotic	Detritus/ Bacterials		9a	GoC		Continuous	1998–2008	ROMS	M	Numerical	ICMAN-CSIC /University Lisbon
254	Biotic	Phytoplankton	ugr/L	9a	GoC		Quarterly, monthly, single	2000-present	Surveys	O	fluorometre, analytical methods	IEO, ICMAN-CSIC
255	Biotic	Phytoplankton	uM N	9a	GoC		Continuous	1998–2008	ROMS	M	Numerical	ICMAN-CSIC /University Lisbon

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
256	Biotic	Phytoplankton	ugr/L	9a	GoC		Daily	1997-onwards	Satellite	O	SeaWiFS, MODIS, MERIS	ICMAN-CSIC, IEO
257	Biotic	Phytoplankton	#/L	9a	GoC		Monthly	199X-onwards	Coastal toxic phytoplankton monitoring	O	Microscopy	CAP (Consejeria Agricultura y Pesca)
258	Biotic	Phytoplankton	ugr/L	9a	GoC		Monthly	198X-onwards	Estuarine station	O	Analytical methods	CHG
259	Biotic	Phytoplankton	R.U.	9a	GoC		Continuous	2008–2011	Estuarine moorings	O	Fluorescence	ICMAN/CSIC
260	Biotic	Zooplankton	#/m^3	9a	GoC		Quarterly, monthly, single	2000-present	Surveys	O	Analytical methods	IEO, ICMAN-CSIC
261	Biotic	Zooplankton	uM N	9a	GoC		Continuous	1998–2008	ROMS	M	Numerical	ICMAN-CSIC /University Lisbon
262	Biotic	Zooplankton	#/m^3	9a	GoC		Monthly	1997-present	Guadalquivir monitoring program	O	Analytical methods	IEO/IFAPA
263	Biotic	Zooplankton	#/m^3	9a	GoC				Estuarine surveys	O	Automatic image processing	ICMAN-CSIC
264	Biotic	Epibenthic Invertebrate	# of individulas in taxons	9a	GoC		Once or Twice a year	1993-onwards (2003 lacking)	Soft bottom of the shelf	O	Trawling sampling	IEO
265	Biotic	Endobenthic Invertebrate	# of individuals in taxons	9a	GoC		Four surveys	2008–2009	Estuarine	O	Dredge	ICMAN-CSIC
266	Biotic	Fish	# of individuals in taxons	9a	GoC		Once or Twice a year	1993-onwards (2003 lacking)	Demersals	O	Trawling sampling	IEO
267	Biotic	Fish	Tonnes	9a	GoC		Once each surveyed year	2004, 2006/2007, 2009/2010, 2012–2015	Anchovy	O	Acoustic	IEO
268	Biotic	Fish	Tonnes	9a	GoC		Once each surveyed year	2005, 2008	Anchovy	O	DEPM	IEO
269	Biotic	Fish	Tonnes	9a	GoC		Monthly	2011, 2014	Anchovy	M+O	Bayesian Model	ICMAN-CSIC
270	Biotic	Fish	#/m3 per species	9a	GoC		Quarterly, monthly	2002-present	Ichtyoplankton	O	Bongo Tow	IEO, ICMAN-CSIC
271	Biotic	Bird	To be found	9a	GoC		Monthly	Early XX century onwards	Census	O	Standard methods in bird quantification	EBD-CSIC, SEO (Sociedad Española de Ornitología)
272	Biotic	Mammal	To be found	9a	GoC		To be found	Recent data (to be found)	Census	O	Standard methods in mammal quantification	CIRCE
273				9a	GoC							
274	Biotic	Exploited species	Landing	9a	GoC		Weekly	1985-onwards	Landing by boat and harbour	O	Fisheries statistics	CAP
275	Biotic	Exploited species	Depending on biological parameters	9a	GoC		Monthly	199X-onwards	Landing and sampling in harbours	O	Size structure and biological parameters (anchovy, sardine, hake, …) inseveral harbours DCR	IEO

Data	Type	Variable	Unit	Area	Subregion	Season	Temporal	Years	Source	Method	Method/Gear	Contact/ weblink
276	Biotic	Sensitive species		9a	GoC				Birds migrating between Africa and Europe			
277	Biotic	Sensitive species		9a	GoC				Tuna, killerwhales,migrating for reproduction between Atlantic and Mediterranean			
278	Biotic	Widely distributed and migratory stocks	Tons	9a	GoC		Yearly	XVI century onward	Bluefin Tuna	O	Landings (almadraba)	Casa Ducal de Medina-Sidonia, ICATT
279	Biotic	Widely distributed and migratory stocks		9a	GoC				Birds			